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REPORT

OF THE

GOVERNOR OF ARIZONA

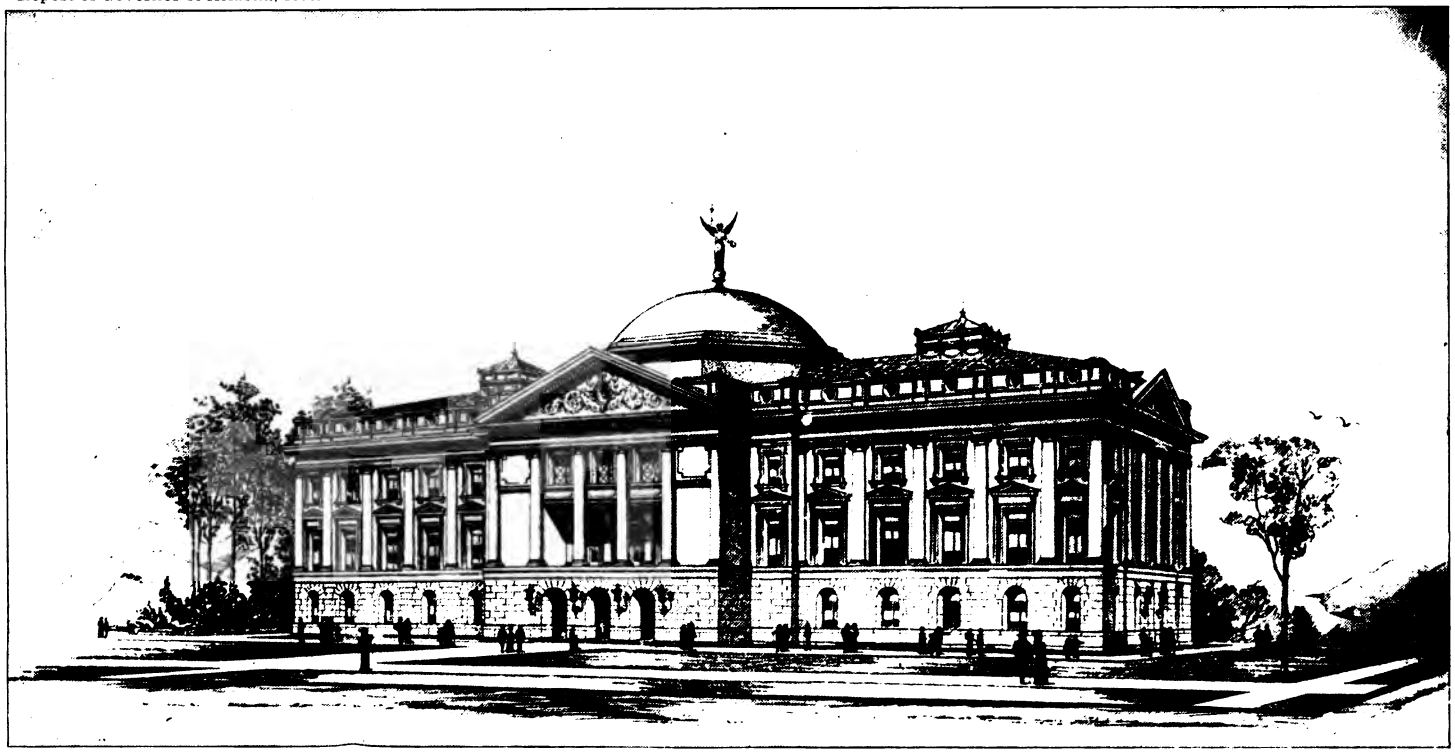
TO THE

From

SECRETARY OF THE INTERIOR.

1901.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1901.



CAPITOL AT PHŒNIX.

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REPORT

OF THE

GOVERNOR OF ARIZONA.

EXECUTIVE DEPARTMENT OF ARIZONA,
Phoenix, Ariz., September 15, 1901.

SIR: I have the honor to submit the following report of the affairs, development, and resources of Arizona for the year ended June 30, 1901:

The Territory has been very prosperous during the year. Bountiful rains have made agriculture, horticulture, and grazing especially profitable; and mining, manufacturing, and every material industry have progressed in a remarkable degree.

The wealth of the Territory is rapidly growing. The assessed valuation of property has increased nearly $6,000,000 since my last report was rendered. Our population has increased 104 per cent in a decade, and the evidences herein submitted should be convincing as to the qualifications of Arizona for self-government.

POPULATION.

According to the national census of 1900 the population of Arizona was 122,212. Recently the statistics have been furnished in detail.

There was a total white population of 92,903. Of this number, 55,230 were males and 37,673 were females.

The total number of Indians was 26,480, a decrease of 1,989 from the number found in the census of 1890.

There were 1,848 negroes, of whom 1,363 were males and 485 females.

There were 1,419 Chinese, of which number there were only 32 females.

The Japanese numbered 264, including 17 females.

Of the white population, 70,508 were native born and 22,395 foreign born. In the returns so far received the foreign-born citizens are not segregated as to nativity, and it is impossible, therefore, to give with exactness the preponderating nationalities. It is quite certain, however, that the assumption generally held in the East that our foreign-born population is mostly Mexican is an error. All the important mining districts contain a large number of Irish and Cornish miners, with a respectable representation from Sweden, Germany, and Italy. I doubt whether our Mexican citizens comprise one-half of our so-called foreign population.

A number of localities in the Territory have expressed dissatisfaction with the census returns; but, undoubtedly, the greatest injustice was done to the city of Phoenix, the capital, in fixing its population at 5,544 only. As explained in my report of last year, the discrepancy between the census figures and the actual population was undoubtedly due to a great extent to the fact that the enumeration was made in the summer, when a large proportion of the population was at the seashore and other summer resorts, and some of the shortage was, doubtless, on account of careless work of the enumerators. For the city election in May, 1901, the registration in Phoenix was 2,137, which would indicate a population this year of at least 10,000.

In giving a list of the cities and towns of the Territory, the census tables omit the thriving town of Bisbee, in Cochise County, as the place is not incorporated. The population of Bisbee is probably not less than 5,000.

For a number of years the annual school census has shown a yearly increase of about 10 per cent in the number of school children.

From the data furnished by the school census and from other sources of reliable information, I am convinced that the population of the Territory is now at least 135,000.

Below will be found the figures and comments of the Census Bureau on the population of the Territory.

Arizona was organized as a Territory February 24, 1863. In 1860 Arizona constituted the county of Arizona, in the Territory of New Mexico, and had a population of 6,482. Table 1 shows the population of Arizona at each census from 1870 to 1900, inclusive, together with the increase by number and per cent during each decade.

TABLE 1.—*Population of Arizona, 1870 to 1900.*

Census years.	Population.	Increase.	
		Number.	Per cent.
1900	122,212	62,592	104.9
1890	59,620	19,180	47.4
1880	40,440	30,782	318.7
1870	9,658	----	----

The population of the Territory in 1900 is 122,212 as compared with a population in 1890 of 59,620. This shows an increase during the decade of 62,592, or 104.9 per cent. This large increase is due in part to the fact that there were 28,469 Indians and 154 other persons, or a total of 28,623 persons, on Indian reservations, etc., in Arizona who were specially enumerated in 1890 under the provisions of the census act, but were not included in the general population of the Territory at that census. The population of the Territory in 1870 was 9,658, and during the ten years from 1870 to 1880 it increased 30,782, or 318.7 per cent, giving a population in 1880 of 40,440. The population in 1890, as stated in the report for that census, was 59,620, representing an increase during the decade of 19,180, or 47.4 percent.

The population of Arizona in 1900 is more than twelve times as large as the population given for 1870, the first census taken after its organization as a Territory in 1863.

The total land surface of Arizona is approximately 112,920 square miles, the average number of persons to the square mile at the censuses of 1890 and 1900 being as follows: 1890, 0.5; 1900, 1.

Table 2 shows the population of Arizona by counties at each census from 1870 to 1900, inclusive, while Table 3, which immediately follows, shows for each county the increase by number and per cent during the ten years from 1890 to 1900.

TABLE 2.—*Population of Arizona, by counties, 1860 to 1900.*

Counties.	1900.	1890.	1880.	1870.	1860.
The Territory	122,212	59,620	40,440	9,658	[1] 6,482
Apache [2]	8,452	4,281	5,283	.....	.....
Cochise [3]	9,251	6,938	.....	.....	.....
Coconino [4]	5,344	.....	.....	.....	.....
Gila [5]	[6] 4,264	2,021	.....	.....	.....
Graham [7]	[6] 14,162	5,670	.....	.....	.....
Maricopa [8]	21,352	10,986	5,689	.....	.....
Mohave	3,443	1,444	1,190	179	.....
Navajo [8]	[6] 8,817	.....	.....	.....	.....
Pima [9]	14,689	12,673	17,006	5,716	.....
Pinal [5]	6,884	4,251	3,044	.....	.....
Santa Cruz [10]	4,545	.....	.....	.....	.....
Yavapai [4]	13,799	8,685	5,013	2,142	.....
Yuma	4,145	2,671	3,215	1,621	.....
San Carlos Indian Reservation [11]	3,065	.....	.....	.....	.....

[1] Then the county of Arizona, in the Territory of New Mexico.
[2] Parts taken to form Graham in 1881 and Navajo in 1895.
[3] Organized from part of Pima in 1881.
[4] Coconino organized from part of Yavapai in 1891.
[5] Gila organized from parts of Maricopa and Pinal in 1881.
[6] Exclusive of population of San Carlos Indian Reservation.
[7] Organized from parts of Apache and Pima in 1881.
[8] Organized from part of Apache in 1895.
[9] Parts taken to form Cochise and Graham in 1881 and Santa Cruz in 1899.
[10] Organized from part of Pima in 1899.
[11] In Gila, Graham, and Navajo counties, but the population in each county was not separately returned.

TABLE 3.—*Increase in population of Arizona, by counties, 1890 to 1900.*

Counties.	Increase.		Counties.	Increase.	
	Number.	Per cent.		Number.	Per cent.
The Territory	62,592	104.9	Navajo	8,717	.....
			Pima	2,016	15.9
Apache	4,171	97.4	Pinal	2,633	61.9
Cochise	2,313	33.3	Santa Cruz	4,545	.....
Coconino	5,344	.....	Yavapai	5,114	58.8
Gila	2,243	110.9	Yuma	1,474	55.1
Graham	8,492	149.7	San Carlos Indian Reservation	3,065	.....
Maricopa	10,366	94.3			
Mohave	1,999	138.4			

The following Territorial changes in the counties of Arizona have been made since 1890: Part of Yavapai taken to form Coconino in 1891; part of Apache taken to form Navajo in 1895; and part of Pima taken to form Santa Cruz in 1899.

As above stated, three counties, namely, Coconino, Navajo, and Santa Cruz, have been formed since 1890. The remaining ten counties all show increases in population since 1890, and some of them very large increases. These large increases are due in certain cases, however, to the exclusion from the general population of the Territory in 1890 of Indians and other persons on Indian reservations, etc.

The population of Arizona can not be given by precincts for the different counties in 1900, as it is not separately returned. Table 4 shows the population of Arizona by cities, towns, and Indian reservations, so far as it was separately returned at the censuses of 1890 and 1900.

TABLE 4.—*Population of Arizona, by minor civil divisions, 1890 and 1900.*

Minor civil divisions.	1900.	1890.
Apache County [1]	8,452	4,281
Fort Apache Indian Reservation (part of)	360	.....
Total for Fort Apache Indian Reservation in Apache, Gila, and Navajo counties	1,786	.....
Navajo Indian Reservation (part of)	5,136	.....
Total for that part of Navajo Indian Reservation in Apache, Coconino, and Navajo counties, Arizona	6,257	.....
Cochise County	9,251	6,988
Tombstone, city	646	1,875
Coconino County [2]	5,344	.....
Flagstaff, town	1,271	963
Hualapai Indian Reservation (part of)	14	.....
Total for Hualapai Indian Reservation, in Coconino and Mohave counties	635	.....
Navajo Indian Reservation (part of)	709	.....
[For total of that part of Navajo Indian Reservation in Arizona, see Apache County.]		
Supai Indian Reservation (part of)	220	.....
Total for Supai Indian Reservation, in Coconino and Mohave counties	236	.....
Gila County [3]	4,264	2,021
Globe, town	1,495	803
Fort Apache Indian Reservation (part of)	720	.....
[For total see Apache County.]		
Graham County [3]	14,182	5,670
Pima, town	521	750
Solomonsville, city	629	287
Thatcher, town	644	320
Maricopa County	21,352	10,986
Mesa, town	722	.....
Phoenix, city	5,544	3,152
Ward 1	1,588	
Ward 2	1,748	
Ward 3	1,347	
Ward 4	861	
Tempe, town	892	.....
Gila Bend Indian Reservation	227	.....
Gila River Indian Reservation (part of)	1,454	.....
Total for Gila River Indian Reservation in Maricopa and Pinal counties	2,954	.....
Salt River Indian Reservation	1,665	.....
Mohave County	3,443	1,444
Chloride, town	466	.....
Hualapai Indian Reservation (part of)	621	.....
[For total see Coconino County.]		
Supai Indian Reservation (part of)	16	.....
[For total see Coconino County.]		
Navajo County [4]	8,817	.....
Winslow, town	1,305	368
Fort Apache Indian Reservation (part of)	796	.....
[For total see Apache County.]		
Moqui Indian Reservation	3,807	.....
Navaho Indian Reservation (part of)	412	.....
[For total of that part of Navaho Indian Reservation in Arizona see Apache County.]		
Pima County [5]	14,689	12,673
Tucson, city	7,531	5,150
Nomadic Indians	565	.....
San Xavier Indian Reservation	978	.....

[1] Part taken to form Navajo County in 1895.
[2] Organized from part of Yavapai County in 1891.
[3] Exclusive of part of San Carlos Indian Reservation.
[4] Organized from part of Apache County in 1895; exclusive of part of San Carlos Indian Reservation.
[5] Part of Pima County taken to form Santa Cruz County in 1899.

TABLE 4.—*Population of Arizona, by minor civil divisions, 1890 and 1900*—Cont'd.

Minor civil divisions.	1900.	1890.
Pinal County	6,884	4,251
Gila River Indian Reservation (part of) [For total see Maricopa County.]	1,500	.....
Nomadic Indians	559	.....
Santa Cruz County [1]	4,545	.....
Nogales, town	1,761	1,194
Yavapai County [2]	13,799	8,685
Jerome, town	2,861	250
Prescott, city	3,559	1,759
Yuma County	4,145	2,671
Yuma, city	1,402	1,773
Colorado River Indian Reservation	558	.....
San Carlos Indian Reservation [3]	3,065	.....

[1] Part of Pima County taken to form Santa Cruz County in 1899.
[2] Part taken to form Coconino County in 1891.
[3] Located in Gila, Graham, and Navajo counties.

There are 16 incorporated cities and towns in Arizona, for which the population in 1900 is separately returned, and these incorporated places are presented in Table 5 in alphabetical order, being abstracted from Table 4, in which they are presented in detail under the counties in which they are severally situated.

TABLE 5.—*Population of the incorporated cities and towns of Arizona, 1890 and 1900.*

Cities and towns.	Population.		Cities and towns.	Population.	
	1900.	1890.		1900.	1890.
Chloride, town	466	.....	Prescott, city	3,559	1,759
Flagstaff, town	1,271	963	Solomonsville, city	629	287
Globe, town	1,495	803	Tempe, town	892	.....
Jerome, town	2,861	250	Thatcher, town	644	320
Mesa, town	722	.....	Tombstone, city	646	1,875
Nogales, town	1,761	1,194	Tucson, city	7,531	5,150
Phoenix, city	5,544	3,152	Winslow, town	1,305	363
Pima, town	521	750	Yuma, city	1,402	1,773

Of the above-named 16 incorporated places there are only 4 that have a population in 1900 of more than 2,000, namely: Tucson, city, with 7,531; Phoenix, city, with 5,544; Prescott, city, with 3,559, and Jerome, town, with 2,861 inhabitants.

TABLE 6.—*Native and foreign born and white and colored population, classified by sex, by counties, 1900.*

Counties.	Native born.		Foreign born.		Native white—native parents.		Native white—foreign parents.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
Arizona	55,893	42,805	15,902	8,331	26,631	18,199	14,410	11,268
Apache	4,241	3,896	103	57	1,183	987	228	198
Cochise	4,073	2,440	1,838	900	2,409	1,323	1,410	1,080
Coconino	2,931	1,768	651	164	1,664	882	565	308
Gila	2,419	1,698	622	239	1,546	940	518	329
Graham	5,698	4,482	2,612	1,370	3,716	2,905	1,907	1,545
Maricopa	7,397	8,228	1,770	1,062	5,478	4,704	2,193	1,968
Mohave	1,806	1,225	328	67	740	392	335	175
Navajo	4,631	3,896	210	92	1,318	1,019	400	336
Pima	5,470	4,801	2,411	2,007	1,782	1,226	2,388	2,290
Pinal	3,592	2,735	941	511	822	501	882	733
Santa Cruz	1,290	1,097	1,164	994	506	369	768	726
Yavapai	6,921	3,685	2,583	610	4,528	2,422	2,158	1,078
Yuma	1,932	1,291	664	258	908	518	655	471
San Carlos Indian Reservation	1,492	1,568	5	.....	16	11	3	6

TABLE 6.—*Native and foreign born and white and colored population, classified by sex, by counties, 1900*—Continued.

Counties.	Foreign white.		Total colored.[1]		Negro.[2]	
	Males.	Females.	Males.	Females.	Males.	Females.
Arizona	14,189	8,206	16,565	13,463	1,363	485
Apache	102	57	2,831	2,711	1	1
Cochise	1,733	898	359	30	238	37
Coconino	472	163	861	584	32	21
Gila	575	234	402	429	28	20
Graham	2,476	1,368	211	34	38	30
Maricopa	1,622	1,050	1,874	1,568	116	94
Mohave	196	57	863	668	101	76
Navajo	154	90	2,969	2,513	270	56
Pima	2,115	1,945	1,596	1,347	77	41
Pinal	869	500	1,960	1,512	362	55
Santa Cruz	1,124	994	56	2	9	1
Yavapai	2,165	598	653	197	72	51
Yuma	583	252	455	308	19	2
San Carlos Indian Reservation	3	.....	1,475	1,551	.....	.....

[1] Persons of negro descent, Chinese, Japanese, and Indians.
[2] Includes all persons of negro descent.

TAXABLE PROPERTY.

The total assessed valuation of the taxable property in the Territory as ascertained by the Territorial board of equalization at its annual meeting in August, 1901, was $38,853,831.37. The net increase for the year was $5,071,365.38, and a large proportion of this sum was accounted for by the increased valuation of mines, especially in Cochise County. Increased value of other property included: Land and improvements, $471,770.71; town and city lots and improvements, $686,114.53; railroads, $440,769.65; horses, mules and asses, and goats, $41,474. Decreased valuations were found in cattle to the extent of $454,254.35; sheep, $76,051, and swine, $2,009.25. The decreases in cattle and sheep were caused by heavy shipments from the Territory during the year on account of exceptionally good markets for live stock and on account of the unsatisfactory condition in which the ranges had been left by the prolonged drought.

The board of equalization is compelled to base its conclusions on the returns from the several counties. There has been no such change in the method of assessing property as would yield results substantially different from those of former years. In previous reports I have explained that a great quantity of property escapes taxation altogether, and that too often assessments are made upon merely nominal valuations, the consequence being that the tax rate apparently is high. With an earnest hope that a reform could be achieved, I said to the Twenty-first legislative assembly:

> It is very important that you improve the present system for the assessment and collection of taxes, so that the revenue of the Territory may be sufficient for the needs of government and to better protect and maintain the public credit. All property subject by law to taxation should be assessed. I contend that if all the property in the Territory subject to taxation were assessed at a proper valuation, the people who now bear the burdens of government—which are unequally distributed—would pay less than they do under present conditions. Some kinds of property are specifically exempt by law, and whether or not the policy which authorized the exemption was wise, the law and the contract are none the less binding upon the Territory and must be accepted. But a comparatively small proportion of the personal property in the Territory is taxed. Under our system money, securities, jewelry, valuable household furniture, and a large amount of personal property of every nature and description escape taxation altogether. To accuse an honorable citizen of perjury who does not pay taxes upon his personal

property would be extremely harsh, but a large majority of our citizens are unquestionably guilty of constructive perjury—not intentionally so, but when a blank statement is handed to them by an assessor upon which to list their taxable property, and at the bottom of which is an oath which they must sign, they are guilty of constructive perjury if they do not list all their taxable property. The small real-estate owner, the farmer, the grazer with a small band of cattle or sheep can not escape. They must pay, and frequently upon greater values than their property will sell for, but the wealthy cattle or sheep owners, with large droves grazing upon untaxed public domain, do not always return to the assessor all of their property. The great corporations and the wealthy mine owners too often evade bearing their just proportion of the cost of maintaining the government which protects them. Simple justice, nothing more, demands the equitable apportionment of taxes.

If railroads increase in value, if their traffic becomes greater and their earnings larger, if their stock is valued higher upon the stock exchange, based upon legitimate profits, then there is no good reason why their valuation for the purposes of taxation should not be raised. It will not be contended that these values are stationary. Railroads, however, in some instances very justly contend that, although the valuation per mile is low in Arizona, the rate of taxation is so high that they in reality pay more taxes here than they do in States where the valuation is higher and the rate lower. This contention would be removed if a fuller assessment of property were had throughout the Territory, as the rate would be correspondingly lowered.

Either the profits of mines or a proper value upon dividend-paying mines should also be assessed. There can be no possible justification for permitting great producing mines to escape contributing to the revenues of the Territory. It is frequently stated that mines worth $100,000,000 in Arizona, and which pay interest to their owners on that amount, do not pay taxes upon a valuation for all their property, real and personal, of $2,000,000. This is wrong, and in no way can the proposition be defended that great riches in gold, copper, and silver dug from Arizona ground and distributed as dividends in the East and in Europe should not be taxed in some form within the Territory.

The subject should be treated fairly and in the proper spirit, and no extreme nor unreasonable measures adopted, and it is believed that if this class of property can be reached justly, without resorting to inquisitorial procedure, that the wealthy mine owners of the Territory will see the justice of paying a fair tax upon their property or profits. Mining corporations have opposed in every way in their power a bullion tax, or a tax upon the net proceeds of mines, their main argument being that a law authorizing such taxation, if effective, would subject them to inquiry and investigation to such an extent as to be unfair and prejudicial to their business interests, although they declare their entire willingness to pay a just tax upon a proper valuation of their property. I recommend that the Territorial board of equalization be invested with the power to assess mines and to equalize the values of mining property, in addition to the authority which the board now has to assess railroads. Mines are now assessed at a considerable valuation in some of the counties of the Territory and only nominally in others, which is improper discrimination.

No kind of property should escape taxation, unless specifically exempted by law, and I assert without fear of successful contradiction that if all the property in Arizona which should be taxed were assessed and properly valued, the rate of taxation would be lower here than in a majority of the most prosperous States.

Assessors should be appointed in first and second class counties either by the governor or boards of supervisors, men of ability and force of character, to assess property. They should be given ample time and liberally compensated—any first-class county in the Territory can well afford to pay its assessor $5,000 per annum—and he should be required by law to list and assess all property within the county, under the personal supervision of himself and deputies, and sufficient time should be given for the purpose. The increased revenues which would result from a fearless and honest performance of official duty under this plan would many times compensate the county for the increase in the assessor's salary over what is paid now. The practice of copying the old lists and books year after year, and never actually assessing, is reprehensible. There are many reforms necessary in our system of assessment and collection of taxes and revenue provisions which should receive attention from you, and I recommend that you investigate the matter thoroughly.

But there was no new legislation on the subject.

In the following pages the taxable property is set out in detail, with a statement of the bonded and floating indebtedness of the Territory.

It will be noticed that there is a wide discrepancy between the number of live stock listed for taxation and the census figures. This is accounted for by the fact that the assessors do not fully list the personal property in the Territory, and under the present system it is almost impossible for them to do so. I have continually recommended to the legislature remedial legislation on this subject.

Final valuation of property in each county in Arizona in 1901.

APACHE COUNTY.

5,882 acres, cultivated land	$48,106.00
Improvements	39,330.25
17,834 acres, uncultivated land	26,403.15
856,335.57 acres, railroad land	171,327.31
418 town and city lots	20,449.50
Improvements	43,740.00
2,213 range horses	23,635.00
706 work horses	21,071.00
441 saddle horses	8,835.00
19 stallions	815.00
62 mules	1,550.00
140 asses	1,097.00
6,721 range and stock cattle	80,041.00
381 milch cows	7,620.00
94,858 sheep	189,716.00
881 goats	1,762.00
95 swine	285.00
54.48 miles railroad, standard gauge	136,200.00
All other property	117,385.02
Total	939,368.23

COCHISE COUNTY.

43,372 acres, land	$76,011.00
Improvements	73,587.00
47,000 acres land grants	85,000.00
322 patented mines	3,676,831.00
Improvements	227,701.00
922 town and city lots	29,956.00
Improvements	535,688.00
1,610 range horses	17,040.00
906 work horses	30,196.00
1,212 saddle horses	24,240.00
18 stallions	1,000.00
209 mules	5,587.00
110 asses	533.00
55,894 range and stock cattle	558,940.00
20 beef cattle	800.00
389 milch cows	11,243.00
138 bulls	3,155.00
6,150 sheep	12,300.00
311 goats	622.00
112 swine	344.00
200.35 miles railroad, standard gauge	1,164,001.95
All other property	963,631.48
Total	7,498,407.43

COCONINO COUNTY.

28,435 acres of land	$71,682.18
Improvements	22,040.00
479,164 acres of railroad land	95,927.84
399,563 acres of land grants	142,535.21
1 patented mine	1,000.00
Improvements on unpatented mines	21,585.00
4,608 town and city lots	177,319.40
Improvements	314,620.00
1,623 range horses	16,230.00
1,538 work horses	61,520.00
703 saddle horses	17,575.00
3 stallions	475.00
26 mules	1,040.00
87 asses	435.00
11,235 range and stock cattle	116,282.25
235 milch cows	5,170.00
5 bulls	125.00
127,200 sheep	254,400.00
600 goats	1,200.00
209 swine	627.00
135.66 miles railroad, standard guage	296,650.00
All other property	444,571.22
Total	2,063,010.10

GILA COUNTY.

5,779 acres of land	$17,340.00
Improvements	8,500.00
58 patented mines	121,075.00
Improvements	86,495.00
Improvements on unpatented mines	10,200.00
Town and city lots	94,293.47
Improvements	200,136.55
1,363 range horses	13,625.00
1,839 work horses	45,975.00
8 stallions	410.00
122 mules	3,050.00
253 asses	1,265.00
32,138 range and stock cattle	321,380.00
Beef cattle	230.00
144 milch cows	2,880.00
Bulls	310.00
70 sheep	140.00
7,409 goats	14,818.00
338 swine	1,014.00
All other property	395,874.50
Total	1,339,011.52

GRAHAM COUNTY.

27,934 acres of cultivated land	$343,223.37
Improvements	115,957.50
20,802 acres of uncultivated land	122,634.00
Improvements	299,764.90
127½ patented mines	253,266.76
Improvements	112,970.00
2,307 town and city lots	80,535.00
Improvements	217,732.00
994 range horses	10,900.00
1,146 work horses	44,239.32
1,850 saddle horses	46,255.00
9 stallions	780.00
117 mules	3,575.00
287 asses	2,785.00

46,204 range and stock cattle	$462,600.00
19 beef cattle	275.00
822 milch cows	16,525.00
121 bulls	3,390.00
12,432 sheep	24,864.00
5,750 goats	11,500.00
100 swine	594.25
59 miles railroad, narrow gauge	184,184.45
All other property	588,185.97
Total	2,946,736.52

MARICOPA COUNTY.

279,411 acres of land	$3,348,214.00
Improvements	352,413.41
11 patented mines and improvements	6,200.00
14,064 town and city lots	2,463,889.00
Improvements	1,504,688.00
1,862 range horses	20,175.00
2,886 work horses	101,010.00
19 stallions	1,400.00
245 mules	6,125.00
12 asses	605.00
16,271 range and stock cattle	163,310.00
51 beef cattle	1,020.00
4,271 milch cows	106,530.00
242 bulls	5,870.00
9,905 sheep	19,875.00
337 goats	674.00
2,067 swine	6,201.00
97.09 miles railroad, standard gauge	635,514.59
All other property	834,369.00
Total	9,578,083.00

MOHAVE COUNTY.

950.44 acres of land	$2,145.00
Improvements	2,065.00
42,885.23 acres of railroad land	8,577.04
111 patented mines	99,831.60
Improvements	77,155.00
Improvements on unpatented mines	50,382.00
792 town and city lots	43,318.70
Improvements	90,133.00
753 range horses	15,060.00
241 work horses	12,050.00
741 saddle horses	25,935.00
2 stallions	125.00
28 mules	980.00
20 asses	100.00
12,205 range and stock cattle	122,050.00
120 milch cows	2,400.00
4 bulls	100.00
2,828 sheep	5,656.00
2,400 goats	4,800.00
21 swine	63.00
107.881 miles railroad, standard gauge	269,702.50
All other property	200,178.56
	1,032,807.40
Less widows' exemptions	10,115.00
Total	1,022,692.40

NAVAJO COUNTY.

314,912.09 acres of land	$157,456.04
Improvements	23,924.00
721,428.57 acres of railroad land	144,285.71
Town and city lots	107,146.00
Improvements	227,690.00
1,702 range horses	17,020.00
444 work horses	17,760.00
463 saddle horses	9,260.00
9 stallions	450.00
32 mules	960.00
76 asses	380.00
2,871 range and stock cattle	34,452.00
372 milch cows	7,440.00
72,510 sheep	145,020.00
209 goats	1,045.00
125 swine	625.00
57,155 miles railroad, standard gauge	142,887.50
All other property	279,384.93
Total	1,317,186.18

PIMA COUNTY.

67,665 acres of land	$169,537.60
Improvements	87,456.00
17,208 acres of land grants	8,601.00
Improvements	2,000.00
205 patented mines	68,360.00
Improvements	6,550.00
Improvements on unpatented mines	10,700.00
Town and city lots	758,885.00
Improvements	1,051,454.00
1,852 range horses	20,886.00
813 work horses	21,475.00
788 saddle horses	15,760.00
29 stallions	1,185.00
133 mules	3,325.00
16 asses	94.00
24,137 range and stock cattle	241,458.00
260 milch cows	5,735.00
217 bulls	4,390.00
4,620 sheep	9,240.00
82 goats	164.00
40 swine	120.00
64.75 miles railroad, standard gauge	455,640.86
All other property	633,874.00
Total	3,576,893.46

PINAL COUNTY.

55,936 acres of land	$364,024.00
Improvements	93,421.00
31 patented mines	55,000.00
Improvements	3,000.00
788 town and city lots	40,086.00
Improvements	62,580.00
2,385 horses (all kinds)	32,135.00
141 mules	3,525.00
59 asses	300.00
19,017 cattle (all kinds)	227,320.00
3,600 sheep	7,200.00
207 goats	410.00
228 swine	684.00
80.29 miles railroad, standard gauge	543,176.70
All other property	349,451.19
Total	1,782,312.89

SANTA CRUZ COUNTY.

12,874 acres of land	$31,695.10
Improvements	57,990.00
39,782.16 acres of land grants	51,687.00
60 patented mines	82,850.00
Improvements	3,925.00
Improvements on unpatented mines	4,150.00
Town and city lots	171,361.00
Improvements	219,080.00
1,922 range horses	19,220.00
882 work horses	22,050.00
233 saddle horses	4,660.00
17 stallions	1,020.00
72 mules	1,800.00
223 asses	1,048.00
14,402 range and stock cattle	171,415.00
134 milch cows	2,680.00
142 bulls	3,545.00
68 goats	175.00
30 swine	122.00
52.4 miles railroads, standard gauge	211,699.60
12 Shetland ponies	300.00
All other property	351,893.85
Total	1,414,366.55

YAVAPAI COUNTY.

80,058.60 acres of land	$177,503.17
Improvements	95,787.00
214,755.35 acres of railroad land	42,951.07
99,445.21 acres of land grants	62,153.13
Improvements	5,600.00
434 patented mines	414,745.95
Improvements	626,335.00
Improvements on unpatented mines	213,050.00
Town and city lots	506,198.00
Improvements	715,130.00
3,028 range horses	30,280.00
1,435 work horses	40,562.00
1,195 saddle horses	27,610.00
12 stallions	530.00
90 mules	2,440.00
139 asses	1,090.00
30,580 range and stock cattle	305,080.00
458 milch cows	9,160.00
8 bulls	295.00
43,763 sheep	87,526.00
8,160 goats	16,320.00
213 swine	671.00
60,558 miles railroad, standard gauge	151,395.00
All other property	815,736.02
Total	4,348,148.34

YUMA COUNTY.

29,855.75 acres of land	$48,700.90
Improvements	5,040.00
16 patented mines	4,313.00
Improvements	24,805.00
Improvements on unpatented mines	40,918.00
619 town and city lots	94,529.50
Improvements	88,887.00
151 range horses	1,865.70
908 work horses	22,700.00
62 saddle horses	1,240.00
3 stallions	140.00
50 mules	1,275.00
15 asses	87.00

1,090 range and stock cattle	$11,686.00
8 beef cattle	60.00
246 milch cows	4,920.00
24 bulls	470.00
613 swine	1,841.00
82.5 miles railroad, standard gauge	580,546.30
All other property	93,590.35
Total	1,027,614.75

Final valuations placed on railroads for the year 1901.

Railroad.	Number miles.	Rate per mile.	Total valuation.
Southern Pacific	392.500	$7,036.92	$2,761,993.00
Arizona and Southeastern	40.2	6,078.55	244,358.00
Maricopa and Phœnix and Salt River Valley	34.380	5,014.86	172,411.00
New Mexico and Arizona	87.8	4,040.07	354,718.00
Arizona and New Mexico	41	3,482.55	142,784.45
Southwestern Railroad of Arizona	22.5	2,537.78	57,100.00
Morenci Southern	18	2,300.00	41,400.00
Central Arizona	11	1,363.64	15,000.00
Saginaw Southern	18	833.33	15,000.00
Santa Fe Pacific	386.734	2,500.00	966,835.00
Total	1,052.114		4,771,599.45

Total valuations, by counties, for the year 1901.

County.	Valuation.
Apache	$939,368.23
Cochise	7,498,407.43
Coconino	2,063,010.10
Gila	1,339,011.52
Graham	2,946,736.52
Maricopa	9,578,063.00
Mohave	1,022,692.40
Navajo	1,317,186.18
Pima	3,576,893.46
Pinal	1,782,312.89
Santa Cruz	1,414,366.55
Yavapai	4,348,148.34
Yuma	1,027,614.75
Total valuation for 1901	38,853,831.37
Total valuation for 1900	33,782,465.99
Net gain over 1900	5,071,365.38

Statement of the aggregate amount of each object of taxation in the Territory for the year 1901.

999,731 acres cultivated and uncultivated land	$5,004,675.51
Improvements	1,277,276.06
2,917,567 acres land grants and railroad lands	813,048.31
Improvements	7,600.00
1,376 patented mines	4,783,473.31
Improvements	1,519,921.00
Town and city lots	4,587,966.57
Improvements	5,271,558.55
43,050 horses	868,680.02
1,327 mules	35,232.00
1,437 asses	9,819.00
281,541 cattle	3,022,352.25
377,936 sheep	755,937.00
26,414 goats	53,490.00
4,191 swine	13,191.25
1,052.111 miles railroad	4,771,599.45
All other property	6,058,011.09
Total	38,853,831.37

Average valuations.

Land, cultivated and uncultivated	per acre	$5.01
Land grants and railroad land	do	.28
Horses	per head	20.18
Mules	do	26.55
Asses	do	6.83
Cattle	do	10.74
Sheep	do	2.00
Goats	do	2.02
Swine	do	3.14
Railroads, standard gauge	per mile	4,727.05
Railroads, narrow gauge	do	3,121.77
Railroads, logging roads	do	1,034.48

In addition to the above, there are 462 miles of railroad in the Territory exempted from taxation for a term of years.

Under an agreement between the northern counties and the Santa Fe Pacific Railroad Company, that road is taxed on a gross valuation of $2,500 per mile. If this low valuation is excluded from the above figures, the average valuation of standard-gauge railroads would be $6,218.75 per mile.

Statement showing increase and decrease in valuations as compared with total valuations for 1900.

Increase:		
Land	$288,407.60	
Improvements	183,363.01	
Mines	3,668,501.79	
Town and city lots	115,984.48	
Improvements	570,130.05	
Horses	25,584.37	
Mules	78.02	
Asses	2,767.00	
Goats	13,045.00	
Railroads	440,769.65	
All other property	324,238.01	
		$5,632,868.98
Decrease:		
Improvements on mines	29,189.00	
Cattle	454,254.35	
Sheep	76,051.00	
Swine	2,009.25	
		561,503.60
Net increase over 1900		5,071,365.38

Tax levy for 1901 per $100 valuation.

1.	Territorial general fund, paragraph 3831, Revised Statutes, 1901	$0.35
2.	Territorial Insane Asylum interest fund, paragraph 3615, Revised Statutes, 1901	.10
3.	Territorial Normal School fund, paragraph 3702, Revised Statutes, 1901	.05
4.	Territorial school fund, paragraph 2246, Revised Statutes, 1901	.03
5.	Territorial reform school fund, paragraph 3762, Revised Statutes, 1901	.05
6.	University fund, paragraph 3652, Revised Statutes, 1901	.06
7.	Northern Arizona Normal School fund, paragraph 3718, Revised Statutes, 1901	.02.50
8.	Prison fund, paragraph 3601, Revised Statutes, 1901	.12
9.	Ranger fund, paragraph 3229, Revised Statutes, 1901	.05
10.	Redemption fund, paragraph 3615, Revised Statutes, 1901	.03.50
11.	Capitol building fund, act 35, laws 1901	.03.50
12.	Interest World's Fair bonds, act 103, laws 1891	.00.50
13.	Capitol interest fund, act 9, laws 1897	.02
14.	Territorial interest fund, paragraph 2047, Revised Statutes, 1887, and act of Congress, 1890	.14

15. Territorial prison improvement fund, act 14, laws 1901	$0.03.50
16. Normal School of Arizona, dormitory fund, paragraph 3699, Revised Statutes, 1901	.02
17. Northern Arizona Normal School fund, paragraph 3719, Revised Statutes, 1901	.01
18. Insane Asylum improvement fund, act 62, laws 1901	.03
19. University interest fund, paragraph 3663, Revised Statutes, 1901	.00.50
Total	1.17

Statement of the bonded and floating indebtedness of the Territory June 29, 1901.

Date.	Title.	Time.	Rate.	Amount.
		Years.	*Per cent.*	
July 1, 1885	Insane Asylum bonds	20	7	$50,000.00
Jan. 15, 1888	Territorial funding bonds	25	6	140,000.00
July 15, 1892	do	50	5	2,000,000.00
Jan. 15, 1896	do	50	5	300,000.00
July 1, 1892	World's fair bonds	20	5	30,000.00
June 1, 1898	Capitol building bonds	50	5	100,000.00
Total				2,620,000.00
Deduct county and city indebtedness				1,634,027.57
Bonded debt account of Territory				985,972.43
Floating debt (general fund warrants)				167,347.99
Total				1,153,320.42
Cash in hands of treasurer available for the redemption of the above Territorial indebtedness				77,368.65
Net indebtedness account of Territory				1,075,951.77

Condition of national banks, June 29, 1901.

RESOURCES.

	Loans, discounts, and overdrafts.	Stocks, securities, and claims.	United States bonds and premium.	Cash, and due from banks.	United States redemption fund.	Banking house furniture and fixtures.
Phoenix National Bank, Phoenix	$507,714.74	$91,295.91	$106,690.00	$269,685.72	$5,000.00	$5,009.04
National Bank of Arizona, Phoenix	314,158.36	25,537.38	25,000.00	79,681.84	1,250.00	3,500.00
Consolidated National Bank, Tucson	356,686.01	36,042.85	12,500.00	647,808.29	622.50	20,000.00
Prescott National Bank, Prescott	310,428.24	26,228.20	50,000.00	178,035.59	2,500.00	26,086.86
Arizona National Bank, Tucson	114,484.86	27,934.39	13,000.00	289,160.60	622.50	6,088.72
First National Bank of Clifton, Clifton	37,892.34	.....	7,931.25	80,445.95	375.00	2,600.60
Tempe National Bank, Tempe	56,381.83	.....	6,593.75	11,776.64	312.50	2,300.00
Total	1,697,746.38	207,038.73	221,715.00	1,556,594.63	10,682.50	65,585.22

LIABILITIES.

	Capital stock.	Surplus and undivided profits.	National-bank notes outstanding.	Deposits.	Total.
Phoenix National Bank, Phoenix	$100,000	$82,816.54	$100,000	$722,578.87	$985,395.41
National Bank of Arizona, Phoenix	100,000	39,748.66	25,000	284,378.92	449,127.58
Consolidated National Bank, Tucson	50,000	23,049.92	1,250	999,359.73	1,073,659.65
Prescott National Bank, Prescott	100,000	46,870.81	49,000	397,408.08	593,278.89
Arizona National Bank, Tucson	50,000	17,276.19	2,750	381,264.88	451,291.07
First National Bank of Clifton, Clifton	30,000	834.74	.....	98,410.40	129,245.14
Tempe National Bank, Tempe	25,000	355.23	6,250	45,759.49	77,364.72
Total	455,000	190,952.09	184,250	2,929,160.37	3,759,362.46

Condition of Territorial banks June 29, 1901.

RESOURCES.

	Loans, discounts, and overdrafts.	Stocks securities, and claims.	United States bonds.	Real estate, furniture, and fixtures.	Cash, and due from banks.
The Bank of Arizona	$374,757.14	$17,438.47	$50,000.00	$35,000.00	$432,198.32
The Bank of Bisbee	172,533.18	23,030.58	.....	1,976.86	433,865.86
The Valley Bank	425,184.43	44,629.08	.....	37,096.90	93,411.43
Arizona Central Bank	266,418.97	14,434.41	.....	15,399.63	101,751.27
The Bank of Globe	110,517.87	9,143.84	.....	10,500.00	79,847.60
International Bank	88,197.43	50,851.32	.....	5,511.86	81,441.23
Farmers and Merchant's Bank	142,490.36	3,130.07	.....	3,061.00	43,990.92
Gila Valley Bank	62,888.92	7,773.79	.....	980.00	63,470.93
The Bank of Safford	71,348.28	1,945.87	.....	3,000.00	40,909.62
P. Sandoval & Co	37,584.44	1,087.69	.....	1,411.72	55,153.86
Old Dominion Commercial Co	10,750.00	52,827.55	.....	3,500.00	46,526.87
The Mesa City Bank	48,756.44	.....	.....	5,247.75	12,468.67
The Navajo County Bank	28,696.52	143.00	.....	1,650.00	27,110.85
Home Savings Bank and Trust Co	59,047.80	5,300.72	.....	1,723.07	18,772.43
Bank of Yuma	24,724.01	4,330.98	.....	4,500.00	9,490.92
E. F. Sanguinetti	10,418.76	21,973.57	.....	.....	5,481.61
Total	1,934,314.55	258,040.94	50,000.00	130,558.79	1,545,892.39

LIABILITIES.

	Capital stock.	Surplus and undivided profits.	Deposits.	Total.
The Bank of Arizona	$50,000	$25,000.00	$834,393.93	$909,393.93
The Bank of Bisbee	25,000	11,817.21	594,589.27	631,406.48
The Valley Bank	100,000	34,826.95	465,494.89	600,321.84
Arizona Central Bank	40,000	13,370.63	344,633.65	398,004.28
The Bank of Globe	25,000	8,172.30	176,837.01	210,009.31
International Bank	50,000	.....	176,001.84	226,001.84
Farmers and Merchants' Bank	40,000	14,189.31	138,483.04	192,672.35
Gila Valley Bank	25,000	1,601.58	108,512.06	135,113.64
The Bank of Safford	10,000	9,497.64	97,706.13	117,203.77
P. Sandoval & Co	20,000	3,479.31	71,758.40	95,237.71
Old Dominion Commercial Co	22,500	25,308.45	65,795.97	113,604.42
The Mesa City Bank	12,500	781.56	53,191.30	66,472.86
The Navajo County Bank	10,000	27.09	47,573.28	57,600.37
Home Savings Bank and Trust Co	10,000	2,891.50	71,952.52	84,844.02
Bank of Yuma	10,000	915.25	32,130.66	43,045.91
E. F. Sanguinetti	20,000	607.40	17,266.54	37,873.94
Total	470,000	152,486.18	3,296,320.49	3,918,806.67

Comparative statement, Territorial banks.

	1900.	1901.	Gain
RESOURCES.			
Loans, discounts, and overdrafts	$1,385,687.12	$1,934,314.55	$548,627.43
Stocks, securities, and claims	151,269.03	258,040.94	106,771.91
United States bonds (par value)	50,000.00	50,000.00	.....
Real estate, furniture, and fixtures	113,502.28	130,558.79	17,056.51
Cash and due from banks	1,187,113.63	1,545,892.39	358,778.76
Total	2,887,572.06	3,918,806.67	1,031,234.61
LIABILITIES.			
Capital stock	396,050.00	470,000.00	73,950.00
Surplus and undivided profits	89,504.71	152,486.18	62,981.47
Deposits	2,402,017.35	3,296,320.49	894,303.14
Total	2,887,572.06	3,918,806.67	1,031,234.61

Condition of building and loan associations June 29, 1901.

RESOURCES.

	Loans on real estate.	Loans on stock.	Sundry assets.	Real estate.	Cash.
Tucson Building and Loan Association	$192,200.00	$3,561.00	$7,908.82	.....	$2,817.88
Citizens' Building and Loan Association	142,242.85	3,485.00	3,679.78	.....	2,206.03
Phœnix Building and Loan Association	93,189.15	4,018.74	9,096.02	$14,745.51	12,916.42
Nogales Building and Loan Association	67,250.00	.....	3,043.88	958.70	1,782.97
Arizona Savings and Investment Co., Tucson	11,350.00	1,000.00	1,221.55	.....	1,310.67
Arizona Mutual Savings and Loan Association, Phœnix	6,450.00	.....	619.10	.....	1,315.38
Total	512,682.00	12,064.74	25,569.15	15,704.21	22,349.35

LIABILITIES.

	Capital stock accumulating.	Undivided profits.	Sundry accounts.	Bills payable.	Total.
Tucson Building and Loan Association	$198,729.13	.....	$3,758.57	$4,000.00	$206,487.70
Citizens' Building and Loan Association	145,624.08	$3,670.89	465.00	1,853.69	151,613.66
Phœnix Building and Loan Association	130,583.33	50.16	3,332.35	.....	133,965.84
Nogales Building and Loan Association	73,035.55	.....	.....	.....	73,035.55
Arizona Savings and Investment Co., Tucson	11,628.10	618.73	2,635.39	.....	14,882.22
Arizona Mutual Savings and Loan Association, Phœnix	7,875.40	384.08	.....	125.00	8,384.48
Total	567,475.59	4,723.86	10,191.31	5,978.69	588,369.45

Comparative statement, building and loan associations.

RESOURCES.

	1900.	1901.	Gain.
Loans on real estate	$424,334.69	$512,682.00	.....
Loans on stock	6,397.52	12,064.74	.....
Sundry assets	13,586.55	25,569.15	.....
Real estate	20,301.75	15,704.21	.....
Cash	32,395.43	22,349.35	.....
Total	497,018.94	588,369.45	$91,350.51

LIABILITIES.

	1900.	1901.	Gain.
Capital stock accumulating	$487,654.84	$567,475.59	.....
Undivided profits	46.98	4,723.86	.....
Sundry accounts	6,217.12	10,191.31	.....
Bills payable	3,100.00	5,978.69	.....
Total	497,018.94	588,369.45	$91,350.51

CUSTOMS.

Number of dutiable and free entries, fiscal years 1900 and 1901.

Years.	Dutiable.	Free.
1899-1900	810	347
1900-1901	909	409
Increase	99	62

Cost of collecting the revenue.

1899-1900	$23,934.70
1900-1901	28,190.80
Increase	4,256.10

Number of cattle imported, free and dutiable, with value of dutiable.

Years.	Dutiable.	Free.	Value of dutiable.
1899-1900	18,271	681	$190,130
1900-1901	40,653	766	459,017
Increase	22,382	85	268,887

Duties levied and collected on cattle.

Years.	Number head.	Duties collected.	Average duty per head.
1899-1900	18,271	$62,083.03	$3.39
1900-1901	40,653	140,875.13	3.46

Exports.

Years.	Value.
1899-1900	$1,785,066
1900-1901	3,043,647
Increase	1,258,581

Warehouse and immediate transportation.

When imported.	Values.	Duties.
1900.		
July	$47,077	$11,170.97
August	19,566	4,281.87
September	42,027	7,637.76
October	43,114	8,313.10
November	82,696	23,565.28
December	56,178	18,507.11
1901.		
January	52,259	9,765.66
February	45,746	11,389.18
March	43,124	8,111.76
April	43,796	9,753.90
May	39,313	8,772.89
June	28,323	8,801.31
Total, 1900-1901	543,216	140,070.79
Total, 1899-1900	769,500	172,129.49
Decrease	226,284	32,058.70

SETTLEMENT OF LANDS.

NORTHERN AND SOUTHERN LAND DISTRICTS.

Status of lands in Tucson, Ariz., land district at the close of business June 30, 1901.

County.	Area unappropriated and unreserved.			Area reserved.	Area appropriated.	Total.
	Surveyed.	Unsurveyed.	Total.			
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Apache	21,206	18,009	39,215	204,980	2,805	247,000
Cochise	1,443,627	2,129,879	3,573,506	132,599	275,895	3,982,000
Gila	59,875	372,688	432,563	745,807	33,130	1,211,500
Graham	753,287	2,095,524	2,848,811	1,010,000	279,189	4,138,000
Maricopa	999,801	2,663,345	3,663,146	193,000	569,854	4,426,000
Navajo				70,000		70,000
Pima	1,139,115	4,491,635	5,630,750	91,414	445,336	6,167,500
Pinal	810,480	2,125,875	2,936,355	295,970	242,175	3,474,500
Santa Cruz	226,926	385,940	612,866	160,320	26,314	799,500
Yuma	646,525	3,855,370	4,501,895	65,442	364,663	4,932,000
Total	6,100,842	18,138,265	24,239,107	2,969,532	2,239,361	29,448,000

Status of lands in Prescott, Ariz., land district June 30, 1901.

County.	Area unappropriated and unreserved.			Area reserved.	Area appropriated.	Total.
	Surveyed.	Unsurveyed.	Total.			
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Apache	1,032,057	690,157	1,722,214	3,977,886	1,222,900	6,923,000
Coconino	614,781	8,488,205	9,102,986	3,427,545	699,469	13,230,000
Gila	41,195	1,295,600	1,336,795	378,127	3,078	1,718,000
Maricopa	153,768	1,217,732	1,371,500	40	3,460	1,375,000
Mohave	984,099	5,721,942	6,707,041	383,990	45,969	7,136,000
Navajo	1,270,085	633,000	1,903,085	3,395,820	1,011,095	6,310,000
Yavapai	856,233	3,718,182	4,574,415	184,130	498,455	5,257,000
Yuma		1,193,900	1,193,900	201,600		1,395,500
Total	4,952,218	22,958,718	27,910,936	11,949,138	3,484,426	43,344,500

Transactions for the fiscal year ending June 30, 1901, in the United States land office at Prescott, Ariz.

Class of entry.	Entries.	Acres.
Sales of mineral lands	64	3,985
Homestead entries commuted to cash under section 2301, Revised Statutes	12	1,502
Original homestead entries	32	4,026
Final homestead entries	53	7,422
Original desert-land entries	4	560
Final desert-land entries	3	200
Indian allotment applications	2	240
Reservoir applications	2	15,348
Station grounds	1	90
Lieu selections under act June 4, 1897 (30 Stats., 36)	12	1,502
Total	185	34,875

RAILROADS.

Railroad building has been especially active in Arizona during the year. The Arizona and Southeastern has been extended southeast of Bisbee to Nacosari, Mexico, and is projected to go farther south. It crosses the Territorial line at Douglas, Cochise County. The members of the same company under a different organization are con-

structing a line east from Douglas to El Paso, and the work thereon is rapidly progressing. A line is also projected from a point on the Arizona and Southeastern to the famous mining camp of Tombstone, and will be built very soon. It is reliably stated that the Rock Island Railroad is arranging to extend west from El Paso across Arizona to the coast, which will give the Territory the benefit of three transcontinental trunk lines. It is presumed that the Rock Island road will connect with the line being built by Phelps, Dodge & Co. to El Paso, although there may be independent construction. The Arizona and New Mexico, a narrow gauge between Clifton, Ariz., and Lordsburg, N. Mex., has been widened to a standard gauge during the year, and it is proposed to extend the line south from Lordsburg to connect with the line from Bisbee to El Paso. Surveys have been made for the purpose. A narrow-gauge road has been constructed from Guthrie, on the Arizona and New Mexico, to the thriving copper camp of Morenci, a distance of 18 miles. The road is a marvel of engineering skill, the grade in places being 5 per cent and crossing itself five times in loops. Many tunnels are necessary to make it possible to get up the mountains. The road from Williams, on the Santa Fe Pacific Railroad, to the Grand Canyon, a distance of 64 miles (which road is now owned by the Santa Fe), is about completed, the work of construction being actively pushed on the last few miles.

The Prescott and Eastern Railroad is building a branch from Mayer up Big Bug Creek, a distance of 10 miles, to the mining district at the head of Lynx Creek. The mines will be reached through a tunnel 8,000 feet in length, which is being rapidly driven. Another branch line has been surveyed a distance of 25 miles from Mayer into the Bradshaw Mountains, a very rich mining district, which branch will undoubtedly be built in the near future. Surveyors are in the field working on a line from Phoenix to Benson, a distance of 150 miles. It is proposed to extend the Santa Fe, Prescott and Phoenix road to connect with the Arizona and Southeastern at Benson, via Tempe, Florence, and the San Pedro Valley. The value of this road in developing central Arizona will be great. The road is sure to be built, and active construction will soon begin. It is practically assured that no part of the country will witness greater progress in railroad construction during the next few years than will be seen in Arizona. The benefits of these lines in developing the resources of the Territory can not be overestimated.

The roads now in operation in the Territory are as follows:

	Gauge.	Miles.
	Feet.	
Southern Pacific of Arizona, extending along the southern part of the Territory from Yuma, on the Colorado River, to the eastern boundary of Cochise County, passing through the counties of Yuma, Maricopa, Pinal, Pima, and Cochise	4.8½	383
Santa Fe Pacific, crossing north of the center of the Territory, near the thirty-fifth parallel, and passing through the counties of Apache, Navajo, Cocinino, Yavapai, and Mohave	4.8½	393
Santa Fe, Prescott and Phoenix, running from Ash Fork, on the line of the Santa Fe Pacific, through the counties of Yavapai and Maricopa, to Phoenix	4.8½	197
Gila Valley, Globe and Northern, running from Bowie, on the Southern Pacific, in Cochise County, to Globe, Gila County	4.8½	140
New Mexico and Arizona, running from Benson, on the Southern Pacific, in Cochise County, to Nogales, in the same county, at the Mexican line	4.8½	87
Arizona and New Mexico, running from Clifton, in Graham County, to the Southern Pacific, at Lordsburg, N. Mex	4.8½	71
Arizona and Southeastern, running from Bisbee, Cochise County, to Benson, on the Southern Pacific, in the same county	4.8½	54
Maricopa and Phoenix and Salt River Valley, running from Maricopa, Pinal County, on the Southern Pacific, to Phoenix, Maricopa County, with a branch from Tempe, Maricopa County, to Mesa, in the same county	4.8½	43

	Gauge.	Miles.
	Feet.	
Prescott and Eastern, running from a point on the Santa Fe, Prescott and Phoenix, Yavapai County, to Mayer, in the same county	4.8½	27
United Verde and Pacific, running from Jerome Junction, on line of Santa Fe, Prescott and Phoenix Railway, to Jerome Junction, Yavapai County	3	26
Congress Gold Company, running from Congress Junction, on the Santa Fe, Prescott and Phoenix, in Yavapai County, to the Congress mine	4.8½	4
Arizona and Utah, running from McConnico Junction, on the Santa Fe Pacific, in Mohave County, to Chloride, in the same county	4.8½	23
The Southeastern, from Don Louis Station, on the Arizona and Southeastern Railway, to Douglas, on the boundary line between Mexico and the United States	4.8½	22½
A branch of the Arizona and Southeastern, from Don Louis Station to Naco	4.8½	6
The Morenci Southern, from Guthrie, on the Arizona and New Mexico, to Morenci	3	18
The Santa Fe and Grand Canyon, from Williams, on the Santa Fe, to the Grand Canyon of the Colorado	4.8½	64

In addition to the above a cut-off 21 miles long has been constructed during the year on the Santa Fe, Prescott and Phoenix Railroad, reducing the distance between Ash Fork and Prescott 2½ miles, doing away with heavy grades and a large number of bridges. The Arizona Copper Company, at Clifton, operates about 10 miles of 20-inch gauge railroad between the mines and reduction works of the company, and the great lumber companies at Flagstaff and Williams operate some 25 miles of standard-gauge railroad for logging purposes.

MANUFACTURES.

It was but very recently (July 24, 1901) that the Census Bureau was able to furnish complete statistics of manufactures in the Territory as gathered in 1900.

The figures show such increases in capital and production and in the number of men employed as to be astonishing if it were not remembered that under "Manufacturing" was classified last year for the first time the business of copper smelting and refining, the sum of $17,286,517 representing the value of the copper product, the remainder of the total of $21,315,189 being covered by miscellaneous manufactures. But it should not be forgotten that by far the greatest development in copper production has been during the past ten years, so that the figures for that industry for last year would show remarkable increases were the means for comparison at hand. Considering the fact that prior to a very few years ago Arizona was a "frontier community" indeed, and that the greater part of the advancement in all lines has been during the past decade, the statistics make a creditable showing and present excellent reasons for satisfaction.

It would be difficult to find anywhere a business more permanent in its nature than that of copper mining (upon which the industry of smelting and refining of course depends), as no important copper mine in the Territory has ever shown any signs of exhaustion, and it may be taken for granted that the branches of manufacturing connected with this industry will steadily increase in importance. Last year 1,648 wage earners were employed in the copper smelters.

In the thirty or more other lines of manufacturing 1,620 people were employed.

It is altogether probable that within the near future new manufacturing industries of magnitude will be established. Among the first will doubtless be beet-sugar factories and fruit-canning establishments, for which the field already is inviting.

A substantial hindrance to a rapid expansion of the business of

manufacturing in lines not connected with mining lies in the high c of fuel. This has been true of the greater portion of the Paci coast country. In California the difficulty has been overcome ma rially by the discovery and utilization of extensive deposits of pet leum—fuel oil having largely superseded coal. In many places Arizona the surface indications of oil are promising, and ha attracted the attention of prospectors and investors, who are close investigating the different localities, and very possibly it will not l long until Arizona is numbered among the fuel-oil producers. Pe haps, however, the best assurances of manufacturing industries on large scale in the future are found in the now undeveloped wat power of the Terrritory. The storage of water for irrigation, explained elsewhere, will begin a prosperous era for manufacturin

An analysis of the statistics of manufactures is interesting, an the figures and comments of the Census Bureau are herewith give in detail. The Bureau states, in explaining the figures, that the st tistics for manufactures and mechanical industries for the Territo for the census year 1900 were taken in accordance with the provisio of section 7 of the act of March 3, 1899, and adds:

This section requires that "the schedules of inquiries relating to the products manufacturing and mechanical establishments shall embrace the name and loc tion of each establishment; character of organization, whether individual, cooper tive, or other form; date of commencement of operations; character of busine or kind of goods manufactured; amount of capital invested; number of proprietor firm members, copartners, or officers, and the amount of their salaries; numb of employees, and the amount of their wages; quantity and cost of materials us in manufactures; amount of miscellaneous expenses; quantity and value of pro ucts; time in operation during the census year; character and quantity of pow used; and character and number of machines employed."

In each of the above particulars the requirements of the law have been observe but certain of the data thus elicited are reserved for publication in the fin volumes.

In drafting the schedules of inquiry for the census of 1900 care was taken preserve the basis of comparison with prior censuses. Comparison may be mad safely with respect to all the items of inquiry except those relating to capital, th average number of employees, and the total amount of wages. Live capital, th is, cash on hand, bills receivable, unsettled ledger accounts, raw materials, stock i process of manufacture, finished products on hand, and other sundries, was firs called for at the census of 1890. No definite attempt was made, prior to the censu of 1890, to secure a return of live capital invested.

Changes were made in the inquiries relating to employees and wages in orde to eliminate defects found to exist on the form of inquiry adopted in 1890. At th census of 1890 the average number of persons employed during the entire yea was called for, and also the average number employed at stated weekly rates o pay, and the average number was computed for the actual time the establishment were reported as being in operation. At the census of 1900 the greatest and leas number of employees were reported, and also the average number employed dur ing each month of the year. The average number of wage earners (men, women and children) employed during the entire year was ascertained by using 12, th number of calendar months, as a divisor into the total of the average number reported for each month. This difference in the method of ascertaining the aver age number of wage earners during the entire year may have resulted in a varia tion in the number, and should be considered in making comparisons.

At the census of 1890 the number and salaries of proprietors and firm members actively engaged in the business or in supervision were reported, combined with clerks and other officials. In cases where proprietors and firm members were reported without salaries, the amount that would ordinarily be paid for similar services was estimated. At the census of 1900 only the number of proprietors and firm members actively engaged in the industry or in supervision was ascertained, and no salaries were reported for this class. It is therefore impossible to compare the number and salaries of salaried officials of any character for the two censuses.

Furthermore, the schedules for 1890 included in the wage-earning class overseers, foremen, and superintendents (not general superintendents or managers), while the census of 1900 separates from the wage-earning class such salaried

employees as general superintendents, clerks, and salesmen. It is possible that this change in the form of the question has resulted in eliminating from the wage earners, as reported by the present census, many high-salaried employees included in that group for the census of 1890.

Arizona was organized as a Territory on February 24, 1863. Prior to that date it formed a part of the Territory of New Mexico; therefore the Ninth Census (1870) was the first census in which the statistics for the Territory were published separately.

Table 1 shows the manufacturing and mechanical industries of the Territory of Arizona as returned at the censuses of 1870 to 1900, inclusive, with the percentages of increase for each decade.

TABLE 1.—*Comparative summary, 1870 to 1900, with per cent of increase for each decade.*

	Date of census.				Per cent of increase.		
	1900.	1890.	1880.	1870.	1890 to 1900.	1880 to 1890.	1870 to 1880.
Number of establishments	314	76	66	18	313.2	15.2	266.7
Capital	$10,157,408	$616,629	$272,600	$150,700	1,547.2	126.2	80.9
Wage-earners, average number	3,268	458	220	84	613.5	108.2	161.9
Total wages	$2,369,065	$302.146	$111,180	$45,580	684.1	171.8	143.9
Miscellaneous expenses	$433,272	49,231	[1]	[1]	780.1	.....	.....
Cost of materials used	$8,464,410	$353,814	$380,023	$110,090	2,992.3	[2] 6.9	245.2
Value of products, including custom work and repairing	$21,315,189	$947,547	$618,365	$185,410	2,149.5	53.2	233.5

[1] Not reported. [2] Decrease.

TABLE 2.—*Summary for all establishments.*

Classes.	Number of establishments.	Capital.	Proprietors and firm members.	Wage-earners.		Miscellaneous expenses.
				Average number.	Total wages.	
Hand trades [1]	122	$201,688	135	243	$163,601	$25,242
Establishments with a product of less than $500	49	22,247	* 53	10	1,966	2,198
Governmental establishments	1	5,000	.....	2	1,320	.....
Penal, eleemosynary, and educational institutions	5	1,185	.....	4	2,945	125
All other establishments	192	9,955,720	176	3,025	2,205,464	408,030
Total	369	10,185,840	364	3,284	2,375,296	435,595

Classes.	Cost of materials used.				Value of products, including custom work and repairing.
	Total.	Purchased in raw state.	Purchased in partially manufactured form.	Fuel, freight, etc.	
Hand trades [1]	$317,450	$900	$296,450	$20,100	$662,088
Establishments with a product of less than $500	5,957	16	5,941	.....	14,353
Governmental establishments	13,984	12,834	100	1,050	16,987
Penal, eleemosynary, and educational institutions	7,958	.....	7,848	110	10,824
All other establishments	8,146,960	4,078,913	1,585,154	2,482,893	20,653,101
Total	8,492,309	4,092,663	1,895,493	2,504,153	21,357,353

[1] Includes bicycle and tricycle repairing, 6; blacksmithing and wheelwrighting, 38; boots and shoes, custom work and repairing, 11; carpentering, 15; clothing, men's, custom work and repairing, 13; clothing, women's, dressmaking, 3; dyeing and cleaning, 1; lock and gunsmithing, 1; masonry, brick and stone, 2; millinery, custom work, 7; painting, house, sign, etc., 5; plastering and stuccowork, 1; plumbing and gas and steam fitting, 8; watch, clock, and jewelry repairing, 11.

While Table 1 shows a rapid increase in the manufacturing and mechanical industries, especially during the past decade, the Territory is preeminently a mining and stock-raising region, and the people are chiefly occupied in the development of the natural resources. The totals for 1870 include two establishments engaged in milling and smelting quartz and copper not included in subsequent censuses. The statistics for smelting and refining, which were included in the report on mining at the censuses of 1880 and 1890, are now included in the report on manufactures and constitute more than 80 per cent of the total product of the Territory. This accounts for the abnormal increase shown in the products.

With the exception of the smelting and refining of ores, manufacturing is almost wholly limited to the so-called neighborhood industries, and practically the entire product is consumed at or near the point of production. The lumber mills and the construction and repair shops of steam railroads are the exceptions to this rule.

Table 2 divides the industries of the Territory between the hand trades and the manufactures proper. This table also gives the statistics for governmental establishments, institutions, and establishments with a product of less than $500, none of which were reported at previous censuses, and therefore are omitted from the other tables and their use confined to Table 2.

In addition to the 369 active establishments in the Territory during the census year with a capital of $10,185,840, shown in Table 2, there were ten idle establishments with a capital of $163,775.

AGRICULTURE AND IRRIGATION.

The voluminous correspondence directed to the office of the governor from all parts of the country bears evidence of a general desire for information concerning the resources of Arizona, particularly with reference to mining and agriculture. And the thousands of requests each year for the annual report (which requests can not be complied with on account of the limited edition) indicate that the information furnished can not be too complete for the satisfaction of the public. In former reports I have dwelt at greater length with the mining industry. On this occasion I consider it proper to present exhaustive intelligence relating to the subjects of agriculture and irrigation, which properly may be considered as one topic.

For the greater part of the statistics, and other details concerning these subjects, I wish to make acknowledgment to the Cenus Office at Washington. Advance proofs were very kindly furnished to me, from which I have been able to report the exceedingly valuable and authentic information contained herein.

Of the 5,809 farms in the Territory, including those in the Indian reservations, 4,210 are irrigated and 1,599 are unirrigated. The acres in the irrigated farms number 558,821; in the unirrigated, 1,376,506. The value of all land in the irrigated farms, not including buildings, is $9,614,352, and of the unirrigated it is $1,802,108. The value of all buildings on irrigated farms is $1,822,322, and for the unirrigated, $444,178. Live stock on the irrigated farms has a value of $8,500,067, and on unirrigated, $6,958,650. The irrigated farms are 72.5 per cent of all; the corresponding percentage of acres is 28.9; that of the value of land and improvements, exclusive of buildings, is 84.2; buildings, 80.4; implements and machinery, 85.7; live stock, 55; and the total of all these forms of farm wealth, 69 per cent.

The average size of all farms, exclusive of holdings by Indians, is 468 acres; the average size of irrigated farms is 175 acres; and the average amount of irrigated land on each irrigated farm is 62 acres. On the farms making use of irrigation the average value of products not fed to live stock is $7 per acre. The unirrigated farms make greater use of the public domain for grazing purposes than do those which are irrigated, and from that source secure an income not directly obtained from the land inclosed in farms. Nevertheless the

IRRIGATING FRUIT TREES.

YOUNG ORANGE GROVE, SALT RIVER VALLEY.

average value per acre of products not fed to live stock on unirrigated farms in 1899 is only $1.79.

In the counties outside of the Indian reservations the average value per acre of land, exclusive of buildings, is, for all farms, $5.74; for unirrigated farms, $1.23; and for irrigated farms, $17.67. The average value of irrigated land per acre is $43.50, while that for the best irrigated land, suitable for growing alfalfa, is from $60 to $200 per acre. Irrigated fruit land is even more valuable.

There are relatively but two river systems, the Colorado and the Gila, it being usual to include the Salt River system with the Gila, although as a matter of fact the Salt carries a larger volume of water than the Gila and under the Salt is found the greatest area of irrigated land. The drainage area of the former and its tributaries, the Rio de Chelly, Little Colorado, Cataract Creek, and Bill Williams Fork, comprises about one-half the Territory. The other half, far more important, agriculturally considered, is embraced by the Gila, with its numerous confluents, each of which is of sufficient prominence to deserve consideration as a separate system, possessing an independent, though tributary, watershed of its own. These tributary members are the Upper Gila watershed, the San Pedro and Santa Cruz watersheds, the Verde, Salt, Agua Fria, Hasayampa, and Lower Gila. Within this area the agricultural wealth of Cochise, Gila, Graham, Maricopa, Pima, Pinal, Yavapai, and Yuma counties is practically embraced.

Flowing in deeply eroded canyons through regions mainly of high plateaus, the Colorado and its branches are rarely available for irrigation purposes except in the southern portions of its watershed, where narrow valleys and basins are found. A review of the progress of irrigation is therefore confined very largely to the watershed of the Gila, wherein the greatest agricultural development has been shown. The region tributary thereto lends itself much more readily and cheaply to the construction of canals and ditches, and comprises far more available land which will ultimately be reclaimed than the drainage area of the Colorado and its affluents. Within this area lie the principal irrigated portions of Arizona, and in it are found the largest and most important irrigation systems. This section of Arizona resembles southern California more closely than it does any other portion of the United States. In many essentials it is not unlike certain districts on the southern and western shores of the Mediterranean, where irrigation is older than the history of the race which now inhabits it. Without irrigation, this part of Arizona is a semitropical desert; with irrigation, it is capable of sustaining a dense population, limited only by the water supply that can be secured by ditches, reservoirs, and wells, and by the wisdom shown in the distribution of water thus obtained.

The development of the Territory by reclaiming its arid but fertile land presents problems of water storage of great importance. Their solution is simplified by the fact that the small precipitation of rain takes place during two plainly marked rainy seasons. In winter the rains begin to fall in December, and the precipitation, while not great, is quite sufficient to cause floods in the streams. The summer rains fall in July, August, and throughout September, and their amount and intensity are considerably in excess of those falling in winter.

While no reservoirs of importance have yet been constructed in the Territory, the future reclamation of large areas of fertile lands depends

upon the storage of flood waters on the sites which nature has provided. When perfected, these reservoirs should be sufficiently extensive to provide water that will last through temporary droughts. They must be provided with enormous waste ways to safely discharge the torrential rainfalls which are not uncommon.

The problem of water storage for irrigation is the most interesting question before the people of Arizona. All are agreed that upon the storage of the flood waters depends the future development of agriculture in the Territory. While there are millions of acres of Government land open to entry, there is hardly an additional acre that is available until the water supply is increased through storage. The executive office is in constant receipt of inquiries from all parts of the Union as to the opportunities in Arizona for settlers on the public lands. To such inquiries the reply is always made that practically speaking, all of the land for which there is water available at present has been acquired by settlers, and the only opening for other agriculturists is to buy land already titled. That there are still many inviting opportunities for men of energy and moderate capital is true, for much of land within reach of water from the canals is held in large bodies and would yield much greater returns if subjected to that thorough cultivation which always attends small holdings in an irrigated country.

The storage problem is twofold: First, it involves increasing the water supply for such canal systems as now carry a deficient volume in the dry season; and, second, a supply sufficiently large and constant to warrant the reclamation of large areas of the so-called desert, or public domain.

That phase of the question which concerns the lands already acquired from the Government is, of course, of more pressing interest to those who hold property in the Territory than is the broad question of the reclamation of the public lands. As explained in my former reports, the returns from agriculture under irrigation have been so remunerative, even under the most adverse conditions of inadequate water, that capital has been led into the construction of canals, for which the water normally is not sufficient, and under these canals settlers have acquired lands from the Government and have gone ahead cultivating and improving their possessions so far as possible, although in many instances the land lies uncultivated year after year simply because there is not water for it.

The best illustration of the conditions here referred to is seen in Maricopa County, the principal agricultural county of the Territory. The area of land which has been settled upon under the various canals in Maricopa County will easily aggregate 300,000 acres, while the land actually irrigated each year will not probably amount to more than 130,000 acres, and for much of this area there is, throughout a long season each year, an insufficient volume of water in the ditches. Contending with this uninviting condition, the agriculturists of the county have made a showing which is really phenomenal. Within the county, including Phœnix, there is property of an assessed valuation of approximately $10,000,000, with an actual valuation much greater than that, and it can be said that nearly all of this wealth has been produced by irrigation. Not only that, but there is probably no other community in the world so uniformly prosperous. Farmers by the score take their families to the seashore and other pleasure resorts in the vacation season, and the agricultural population generally lives more comfortably and enjoys more luxuries than any other farming people in the United States.

DATE PALM, OLIVE, AND FIG TREE, SALT RIVER VALLEY.

OSTRICHES, SALT RIVER VALLEY.

Recognition of these facts, and of the further fact that annually enough water flows to waste in the floods of the Salt River to fully irrigate all of the 300,000 acres under the canals if it were stored, and the knowledge that storage would make the Salt River Valley one of the wealthiest regions in the world, have caused the people of the valley to turn with earnest attention during the past two years to consideration of the storage problem. As explained in the matter dealing with the progress of irrigation in the several counties, Maricopa County is fortunately situated in having near a reservoir site in the Tonto Basin which offers a ready solution of the question. There is no division of sentiment as to the necessity of constructing the reservoir. The only doubt is as to the best method of accomplishing success. A private corporation having acquired from the Government the necessary rights to the site, has expended a large sum of money in settling the engineering questions involved, and in the effort to safely finance the project.

The difficulties, however, in the way of obtaining the large capital necessary to the construction of a permanently stable dam have been very great. In the first place, any effort to obtain considerable capital in the money centers of the East for industrial enterprises in Arizona encounters an ignorance of the conditions prevailing in the Territory which makes the task a heavy one. It is all the more difficult to enlist capital for water-storage enterprises on account of the mass of misinformation with which the investing public has been supplied. For instance, the leaders in the propaganda of "Government ownership" of all irrigation enterprises of the future have in mistaken zeal industriously circulated statements to the effect that no storage enterprise by individuals or private corporations can be made to yield a profit on the investment. These statements have been based, as I have explained in former reports, on isolated examples in California which find no parallel whatever in Arizona. The few reservoir projects in California and elsewhere which failed primarily to yield satisfactory returns to stockholders were failures simply because they were carried out without due consideration of the circumstances surrounding them. Due attention had not been given to the water supply and the fact that an irrigation system for lands vacant at the beginning of construction must necessarily wait a term of years for revenue to flow in from the lands to be irrigated, especially if the lands are given over to slow-maturing fruit orchards. Apparently no appreciation of a different situation in Arizona can be brought home to those who have so willingly accepted the dictum that all further progress in the irrigated regions of the West must await appropriations from the Federal Treasury. Anybody at all familiar with existing conditions in the Salt River Valley knows that if a reservoir were assured, every acre available for cultivation under the reservoir would be in tillage and yielding a revenue the first year in which water was supplied.

It is evident that for the Salt River Valley there is not much encouragement in the movement for construction of reservoirs by the Government for the reason that it is feared Congress would not be easily persuaded to appropriate money for the benefit of lands already settled, inasmuch as the headway so far made for reservoir construction for the public lands has not reached the point of assured success. But two solutions accordingly appear to offer. The capital required must be provided by a private corporation, alone or assisted by some form of local encouragement, or the construction must be done by the county or a district thereof. Earnest consideration of these points as is now engaging the attention of the people of the valley.

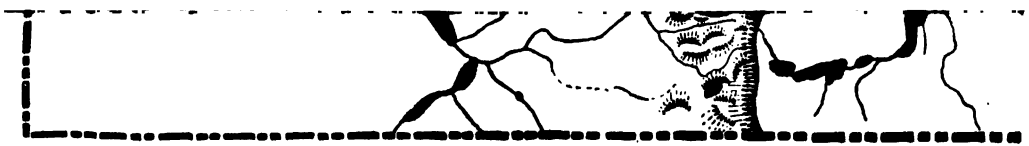
There is of course deep interest in the general question of "Government aid" to the people of the West in the matter of storage enterprises. It is insisted by many, and not without reason, it must be confessed, that the Government very properly could extend financial assistance in the reclamation of the arid lands for the reason that the expenditure would be for the direct benefit of intending settlers and the outlay ultimately would be returned to the public treasury.

If Congress could be brought to a favorable consideration of the proposed system, Arizona offers exceptional reasons for beginning the work here. As heretofore explained, and as forcibly pointed out by the Secretary of the Interior, the construction of the proposed dam at San Carlos on the Gila River would settle permanently the question of a water supply for the Indians on the Gila River Reservation, of whom there are more than 4,000 engaged in an attempt to make a living by farming. Unless a system of irrigation is provided for them by the Government they must inevitably become a burdensome charge upon the National Treasury, whereas their capabilities in the way of self-support are altogether satisfactory. Not only would the San Carlos reservoir provide these Indians with a permanent water supply, but many thousands of acres of vacant land would be available for home-seekers. The revenues from the districts thus irrigated, even though based on a very moderate charge for the water service annually, would be sufficiently large to more than pay a good interest on the money necessary to be invested in construction. Complete information as to the cost of the proposed reservoir is within reach of Congress, and it is to be hoped that the coming session will authorize the beginning of the work. No better opportunity could be offered for a trial of the plan of Government construction of reservoirs.

On the general question as to the best method of quickly bringing about the settlement and improvement of the arid lands, I have in no wise receded from the position heretofore taken, namely, that the most practicable course would be through a general cession of the arid lands to the States and Territories in which they lie. Unless it be assumed at the outset that the people are incapable of self-government, there can be no argument whatever against permitting them to take over the public domain and use it as a basis for obtaining capital for the construction of reservoirs. The entire opposition to the suggestion lies in the assumption that the people are essentially corrupt and that the lawmakers whom they would direct to represent them would be perversely dishonest; in the assumption that it would be impossible for Congress to devise a measure which would properly protect the people from spoliation; and finally in the assumption that capital is always dishonest and should have no consideration or encouragement. Happily such inferential arguments are confined to but a few, and have little popularity in Arizona.

DETAILS CONCERNING IRRIGATION.

Arizona has been inhabited at different times by three races, each making use of irrigation in agricultural operations. Of the first, or prehistoric, race very little is known. Evidences abound that it inhabited Arizona for an extended period and had vanished before the advent of the white man in America. In Maricopa and other counties are found traces of this race, and the present canals and ditches for irrigation in many places follow closely the lines laid down centuries ago. When the region was explored by white men the agricultural



Indians were practicing irrigation of a primitive kind, very much as do their present successors. The white settlers have improved on these methods, and population, agricultural development, and wealth have advanced on lines parallel with the artificial application of water to the cultivation of the soil. The sketch map represents, by areas, in solid black, the main regions in which irrigation has been successfully applied to any considerable extent.

Of the 72,268,800 acres of land surface of Arizona only 1,935,327, or 2.7 per cent, are included in farms in 1900, and only 254,521, or 0.35 per cent, are improved. Of the improved land, 227,890 acres are located outside of the Indian reservations. The importance of irrigation is demonstrated by the fact that irrigated land outside of the Indian reservations has an acreage of 185,396, or 81.4 per cent of the corresponding improved land. The progress of agriculture during the decade ending with 1900 is attributable to the successful application of irrigation to the growing of hay and forage, cereals, vegetables, fruits, and other crops. With reference to the stated acreage of "improved" land, it should be remembered that such acreage by no means represents the area for which title has been obtained from the Government under the homestead and desert-land laws. But until the water supply is increased the acreage of improved land must remain largely stationary.

Within the ten years from 1890 to 1900, 545 miles of canals and ditches were constructed, at a cost of $1,508,469. Out of this total, $512,000 was expended in ditches into which no water had been turned before June 1, 1900. Aside from this amount, $250,000 is represented in canals which were completed within the last few years, and which utilize only a small quantity of the water appropriated for them. The acreage under these ditches, which in the near future will be brought under cultivation, will undoubtedly be much larger than the area now irrigated by all the ditches constructed since 1889. In 1890 the acres irrigated, outside of the reservations, numbered 65,821; in 1900 they numbered 185,396. By the opening of new ditches and canals between 1890 and 1900, 26,297 acres were added to the irrigated area. By the enlargement of the canals previously constructed, and as the result of more intelligent methods of water distribution, 93,278 acres were added to the productive area of the Territory. The total increase in irrigated land in ten years was 119,575 acres. Most of this land was public domain in 1890.

Included in the 185,396 acres of irrigated land are 974 acres on 77 farms which were irrigated wholly or in part by pumped or artesian well water. The use of part of the Territory, comprising, as it does, that portion capable of sustaining the densest population, can not be made by comparisons with any other part of the United States, with the single exception of southern California. The northern portion of Arizona constitutes a region apart. This area, which comprises two-thirds of the Territory, is distinguished in part by the great Colorado plateau, and is 5,000 feet in elevation. It is mainly a level mesa, save where it is broken by the extrusion of groups of volcanic mountains rising above the 7,000-foot line, and in one instance, San Francisco Mountain, attaining the altitude of 13,000 feet. Rainfall is relatively large over this plateau, and in a few localities agriculture on a small scale is successful without the artificial application of water. The fertile but arid plain to the south lies below the plateau and has an altitude of less than 3,000 feet.

In order to insure the best utilization of the rainfall and the melt-

ing snow on the mountains, greater attention must be paid to the preservation of the forests. The disforestation of many mountain slopes, it is claimed by citizens of Arizona, has caused a large increase in the amount of silt and detritus in the river during flood seasons, making more difficult the construction of permanent reservoirs and dams.

With the rapid increase in population and consequent cultivation of larger areas of agricultural lands, these questions are becoming more and more pressing and demand prompt and intelligent consideration. Aside from the surface water, Arizona possesses considerable quantities of tertiary ground water, or so-called underflow, at depths varying from 40 to 1,500 feet. In sections where this supply has been developed considerable tracts of land have been brought under cultivation. The problem of bringing the water to the surface and utilizing it for agricultural purposes is being considered in several counties where the supply of surface water is inadequate.

APACHE COUNTY.

Apache, the extreme northeastern county, extends 48 miles east and west and 240 miles north and south. Within its boundaries are located portions of the Navaho and the White Mountain Indian reservations, the former covering the northern end of the county and comprising about one-third of the total area. In the southern end the White Mountain region attains an elevation of more than 7,000 feet, and approximates an area of 600 square miles. From the base of these mountains the land gradually slopes northward to the Little Colorado River, whence it begins to ascend toward the mountains that cross the central part of the county. The principal agricultural area is embraced in this basin or valley, extending from Greer to Concho, and including the towns of Eagar, Springerville, Tule, and St. Johns. As a rule, irrigation is necessary, and is practiced from February to October. In July and August there is usually a medium rainfall; this, in some years, lessens the need of irrigation, and late crops of corn, etc., are frequently produced without it. The soil is fertile, and where sufficient moisture is obtained the yield is abundant.

The Little Colorado River, which rises in the White Mountains, and its southern tributaries, the Nutrioso, Coyote, and Coulter creeks, are the chief sources of water supply. Owing to the light snowfall in the mountains, there was an unusual scarcity of water in 1899. This shortage of water was greatest in the months of June, July, and August, and consequently the area irrigated was much smaller than in ordinary years. In some localities, because of the extreme drought, no crops whatever were cultivated; in others, only one-eighth to one-half of an ordinary yield was produced, while a few, favored by reservoirs, in which the early flood waters had been conserved, were able to report an average crop. By the construction of reservoirs, for which there are a number of available sites, sufficient water could be stored during the flood seasons to irrigate not only all the land under cultivation, but several thousand acres additional, which, now arid and practically worthless, could be added to the productive area.

Most of the ditches were built by the settlers individually to irrigate their own farms. In the case of a few large ditches the water is measured by means of weirs, and is usually supplied to users in a continuous flow. No instance of water having been sold is reported.

Sediment collects to some extent and water plants grow rapidly in the ditches, necessitating an annual cleaning with shovels and scrapers. The chief methods of applying water to the soil are by flooding, in the case of alfalfa and small grains, and by furrows at regular intervals. There is only one instance reported in which this flooding has resulted in bringing alkali to the surface where none previously existed; this is in the neighborhood of St. Johns, and even there the soil has been much improved.

Owing to the many claims on the Little Colorado having prior right to the water, there is frequently a scarcity, notably in the vicinity of Eagar. Especially was this true in 1899, when the acreage was much smaller than usual, and on many farms only one-eighth of an average crop was produced. The necessity for a good system of reservoirs is very apparent, as the soil is exceedingly fertile and yields good crops when sufficient moisture is applied. On account of the light fall of snow in the mountains, the scarcity of water prevented entirely the cultivation of any crops under the West Side ditch at Springerville, and the remaining ditches suffered, though not to a similar extent. The Round Valley Water Storage Company, by the use of reservoirs, was able to supply the water needed to the land situated under it. Experiments with orchard fruits at this place have not been successful, owing to the frosts; but small fruits, such as gooseberries and raspberries, and all kinds of vegetables are raised. On the Black River, 30 miles southwest, there is a small area irrigated from July 4 to July 20, after which time the rainfall supplies all the moisture needed. This locality is in the midst of the White Mountains, at an elevation of 7,000 feet, and is visited by frosts as late as June, and in some seasons as early as August, admitting only the planting of potatoes and oats and barley, which are cut green for hay. From the former large yields are obtained. Priority rights of the ditches located above Tule prevented the irrigators at this place from securing water except during the month of March. A reservoir was constructed at a cost of $1,140, but the constructors were unable to secure permission to build a ditch through a certain tract of land and were forced to abandon it, causing a serious loss to thirty families.

The drought in 1899 prevented the reservoirs at St. Johns from being filled to the high-water mark, and the acreage irrigated was 50 per cent and in some instances 75 per cent less than usual. When the reservoir now under construction is completed it is expected that 4,000 or 5,000 acres additional will be brought under cultivation. East of this place, across the New Mexico border, a valuable reservoir site is reported. It is not situated on any living stream, but is on Largo Creek, or wash, which, reaching east to the Continental Divide, drains 120 square miles. By the construction of a dam it is believed that the annual flood waters would be sufficient to fill the reservoir thus formed, thereby enabling the reclamation of at least 15,000 acres of arid land.

A scarcity of water in the Nutrioso and Coulter creeks caused almost a total failure of the crops on the lands dependent upon them. At Concho a small area of land is supplied with water from springs and reservoirs. The flow of the springs remains unchanged, but the reservoirs failed in the early part of the season. A number of ditches in the vicinity of Ganado are owned exclusively by the Navaho Indians, and were built by them without any assistance from the Government. They are used only during the rainy season and when the snow melts,

as there is not a sufficient amount of water during the dry season to supply them. The Indians have under cultivation approximately 600 acres, upon which they raise all kinds of cereals and fruits.

COCHISE COUNTY.

Cochise County is situated in the southeastern part of Arizona. Extending 83 miles north and south, and 84 miles east and west, it contains an area of 6,147 square miles, being slightly larger than the combined areas of Rhode Island and Connecticut. The surface of the county is rugged, as it is traversed from north to south by three nearly parallel ranges of mountains, known as the Chiricahua, Dragoon and Mule, Whetstone and Huachuca.

Between these ranges are valleys of great fertility, only small portions of which have been brought under cultivation, because of the scarcity of water.

In some localities water is found at very slight depths and is easily tapped by wells, making possible a small amount of irrigation. At St. David and Benson the Mormons have sunk 55 of these wells, varying in depth from 150 to 450 feet, the average being 350 feet. The two largest wells have depths of 275 and 450 feet, respectively, and each discharges 85 gallons per minute from a 2-inch pipe. The average flow of the other wells is about 40 gallons per minute. Sinking these wells is relatively inexpensive. A well having a depth of 295 feet, with a pipe 1½ inches in diameter and flowing 45 gallons per minute, has been put down in three days, at a total cost of less than $55. In this locality there is a comparatively large area supplied from these wells, and it presents one of the most promising fields for irrigation from wells in the Territory.

Sulphur Spring Valley, in the central part of the county, is 30 miles wide and ninety miles long. The White River, which rises in the Chiricahua Mountains, flows west and thence south into Mexico.

During the greater part of the season the river is dry and only a little irrigation is done, and this mostly in the foothills in the vicinity of Bisbee and Pearce. Hay is the principal crop grown, and is irrigated by water obtained chiefly from springs and wells. Water is found at depths of from 10 to 100 feet.

In the west is the San Pedro Valley, the most thickly settled and largest irrigated area in the county. It contains the towns of Benson, Tombstone, Fairbank, and St. David. The San Pedro River, rising in Mexico, flows through this valley in a northerly direction into Pima County, where it joins the Gila. This river is the chief source of water supply, and the principal ditches deriving water from it are the St. David and the Union. A number of small private ditches are also supplied by this stream.

The San Simon Valley is in the eastern part of the county. Owing to the small amount of water in the San Simon River, irrigation is not practiced on a considerable scale, and is confined principally to the vicinity of San Simon. Some artesian wells are in use, the first one in Arizona having been developed in this valley in 1882.

By the construction of reservoirs, for which there are a number of available sites, the water supply could be considerably augmented, and a sufficient quantity stored to irrigate several thousand additional acres of fertile land. What is reported to be a good site is located 15 miles north of the town of Bisbee, where a dam 350 feet in length and 40 feet in height, it is claimed, would furnish a storage capacity for 6,400 acres.

SCENE ON SUPAI TRAIL, CATARACT CREEK, COCONINO COUNTY.

Another site is 1½ miles above Charleston and 26 miles from Bisbee, where a dam 400 feet long and 60 feet high would create a reservoir believed to be of a size sufficient for 6,800 acres. Another advantageous site is reported in the vicinity of San Simon.

Near Fort Huachuca several ranches take small ditches from Babacomari Creek and from springs located in the canyons of the Huachuca Mountains.

But few measurements of water are reported in the county, and no water is sold. No instances of alkali having been brought to the surface are mentioned. It is necessary to clean the ditches annually, owing to the collection of sediment and the growth of water plants in them. The chief method of irrigation is by flooding. Sufficient moisture is furnished during the last of July and August to produce a fair crop of hay without irrigation in most localities. There was a fair amount of rainfall in 1899, but irrigation is relied upon almost wholly to produce crops.

COCONINO COUNTY.

Coconino County, formed in 1891 from a portion of Yavapai County, is situated in the north central part of Arizona. It is the largest county in the Territory and includes within its boundaries parts of the Moqui, Navaho, Hualpai, and all the Supai Indian reservations, the last named being situated in the Grand Canyon forest reserve. The greatest length of the county is 185 miles, its greatest width 140 miles, and its area is nearly 19,322 square miles, being larger than the combined areas of Vermont, Massachusetts, and Delaware. It is on the great Colorado plateau, and the greatest portion has an elevation of nearly 7,000 feet. Across the northern part the county is traversed by the Colorado and its tributary, the Little Colorado. These rivers have cut steep walled canyons thousands of feet in depth, abounding in wildly picturesque scenery and wonderful gorges. Though carrying a large volume the rivers are useless for irrigation as the waters are hundreds or even thousands of feet below the surface of the arable land. Owing to this lack of an available water supply the area irrigated is small and is confined to the localities of Lees Ferry, Tuba, Supai, and Fredonia.

At Lees Ferry the water is obtained from springs in the parish canyon. The supply is more than sufficient for the small area under cultivation, and the crops irrigated are alfalfa, grapes, apples, and peaches. At Tuba water is supplied from Moen Copie wash. There is a slight scarcity in July that could be prevented by small reservoirs along the line of ditch. The Indians at Supai obtain water from Cataract River, which comes out of the ground in torrents at the head of their camp. The flow is so great that the amount used for irrigation is hardly noticeable. Evidences abound showing that irrigation was practiced by the Indians hundreds of years ago, probably long before the white man ever set foot upon the American continent.

The Fredonia ditch receives its water from Kanab Creek. Owing to the great width and sandy nature of the creek bed the flow is very irregular. The winds drive the shifting sands across the stream, causing the water to spread over a large area, where it soon evaporates. There is a scarcity in June and July that could be prevented by piping the water in the creek bed. A reservoir is already in use for this ditch.

The southern portion of the county extends to the forested edges

of the plateau, where it begins to break off. The valleys here are less deep and narrow, and agriculture is attempted on a larger scale. Irrigation is confined to a few acres in the vicinity of Flagstaff and Williams, water from the latter place being furnished by wells sunk to a depth of from 4 to 7 feet. In this section most of the crops are produced by dry farming. Potatoes do especially well, and large shipments are made to various points throughout the Territory.

The ditches for the most part are small and of individual ownership. There is only one instance reported of the sale of water, and only one in which it is measured by weirs. The water of the larger ditches is distributed proportionately to the users, each receiving a continuous flow.

The methods of irrigation are by flooding for hay and by furrows for other crops. There are a few available sites for reservoirs not yet utilized. Throughout the greater portion of the county irrigation is not practiced, the farmers depending on the rainfall for growing their products.

GILA COUNTY.

Gila County, one of the smaller divisions of the Territory, is located in the eastern central portion and comprises an area of 4,542 square miles. Its eastern half is covered by the White Mountain Indian Reservation, which contains nearly all of the arable land in the county. The portion lying outside of this reservation is broken by high mountain ranges. Because of its rugged nature the area capable of irrigation is small, and is situated in the long and narrow valleys of Salt River and Tonto Creek, which are each about 16 miles long and not over 2 miles in width.

The flow of water in Salt River is continuous and the supply is abundant, more than sufficient for all the land that could be brought under cultivation.

In the Tonto Valley the supply is sufficient, and a scarcity only occurs when the ditches are not cleaned and kept in repair. North of here, however, at Pine, the farmers state that they receive water from creeks only after rain storms, and the supply is by no means adequate. This scarcity, which is most felt in June and July, could be prevented by the construction of reservoirs, for which there are said to be several small sites in this locality. The number of acres under cultivation in the Tonto Basin is approximately 1,500.

In the Pinal Creek Valley, which is 10 miles long by 1 mile wide, the area irrigated was small.

All the ditches are small and are owned by individuals. The most important one reported is the Kenton, above Livingston, in which seven farmers are interested. Water is diverted into it, as in all the others, by small temporary dams extending across the streams, no permanent dam being able to withstand the spring floods. The chief methods of irrigation are by flooding with small checks for grain and alfalfa and by furrows for other products.

In the valley of the Salt River at the junction of Tonto Creek, 25 miles northwest of Globe, there is an excellent site for a reservoir that is to be utilized for the benefit of lands near Phoenix.

The dam site is on the Salt River, in the mountains, some 60 miles northeast of Phoenix, at the point where the river, leaving the Tonto Basin, enters a deep, narrow gorge in the solid rock, known as the Box Canyon. The gorge is but 200 feet wide at the level of the stream, and for the first 100 feet upward the walls are perpendicular. In the preliminary reconnoissance bed rock was located at an average

HEAD OF ARIZONA CANAL DAM, ON SALT RIVER.

depth of 25 feet below the stream bed. It is proposed to build a masonry dam which will be 200 feet high above low water, and, allowing for waste ways 20 feet deep, will create a reservoir 180 feet deep. The dam will be 650 feet long on top. The waste ways on each side of the dam are calculated to pass, without overtopping the dam, the greatest known flood, that of 1891, when the discharge during part of one day was equal to one-half of that running over Niagara Falls.

The reservoir site, covering over 18 square miles, is likewise ideally located by nature. Into this basin is carried the run-off from a drainage area of nearly 6,000 square miles, most of which is within the region of the greatest precipitation in the Territory. The greater portion of this watershed has a rainfall of 15 to 20 inches and upward annually. It requires but 3½ inches depth of run-off from this shed, or 20 per cent of 16 inches of rainfall, to produce 1,000,000 acre-feet. The storage capacity of the reservoir is limited only by the height of dam which it is practicable to build, and the capacity of the reservoir which will be created by the dam projected will be stupendous—no less than 757,000 acre-feet, or 32,670,000,000 cubic feet of water. It is conservatively estimated that the 757,000 acre-feet thus stored will be ample for the irrigation of 300,000 acres of land. That the company is fully warranted by the water supply in constructing a reservoir of this enormous capacity can not be doubted. Measurements of the flow of Salt River during a period of years show the run-off to have been as follows:

	Acre-feet.
1889	1,134,780
1890	1,659,500
1891	2,000,000
1892	663,000
1893	1,000,000
1894	277,700
1895	1,124,000
First half of 1896	226,248

The measurements were taken at a point on the Salt River a short distance above its junction with the Verde. The figures for the years 1897 and 1898 are not at hand. The year 1899 was one of extraordinary drought, and the discharge, as appears in the table thereof under the head of Maricopa County, was but little more than 265,000 acre-feet.

With a dam storing 757,000 acre-feet, the reservoir would have passed through this cycle of dry and wet years and supplied 750,000 acre-feet in every year but 1894 (said to be the driest year on record with the exception of 1899), when it would have yielded, with the water carried over from the previous year, nearly the quantity without emptying the reservoir.

Under the land act of March 3, 1891, the Government has granted the site to the Hudson Reservoir and Canal Company. From the dam site to the irrigated region of the Salt River Valley, a distance of about 30 miles, the river flows through a canyon, and the company has appropriated, under the Territorial laws, this channel as its canal for conveying the impounded water.

The estimated cost of the Tonto Basin dam, complete, is $2,500,000. The plans are so drawn, however, as to permit of building the dam in two sections, so that in case of difficulty in procuring funds sufficient to build the dam to the ultimate height projected, the first section may be built to a height which will impound 300,000 acre-feet of water, the second section to be completed thereafter as convenient. But the indisputable merit of this enterprise should make it no diffi-

cult undertaking to obtain in the beginning all the capital necessary for construction.

Vitally important as this project is to the irrigation and all other vested interests in the Salt River Valley, the Globe copper-mining district and the mining region between Globe and the dam are little less interested. To the mines and smelters of that locality the high cost of fuel is a serious hindrance to development and profit. Wood appears to be an exhausted quantity, practically, and coal costs $12 per ton. The estimated average cost of producing a horsepower for one year is $187.50 for fuel alone.

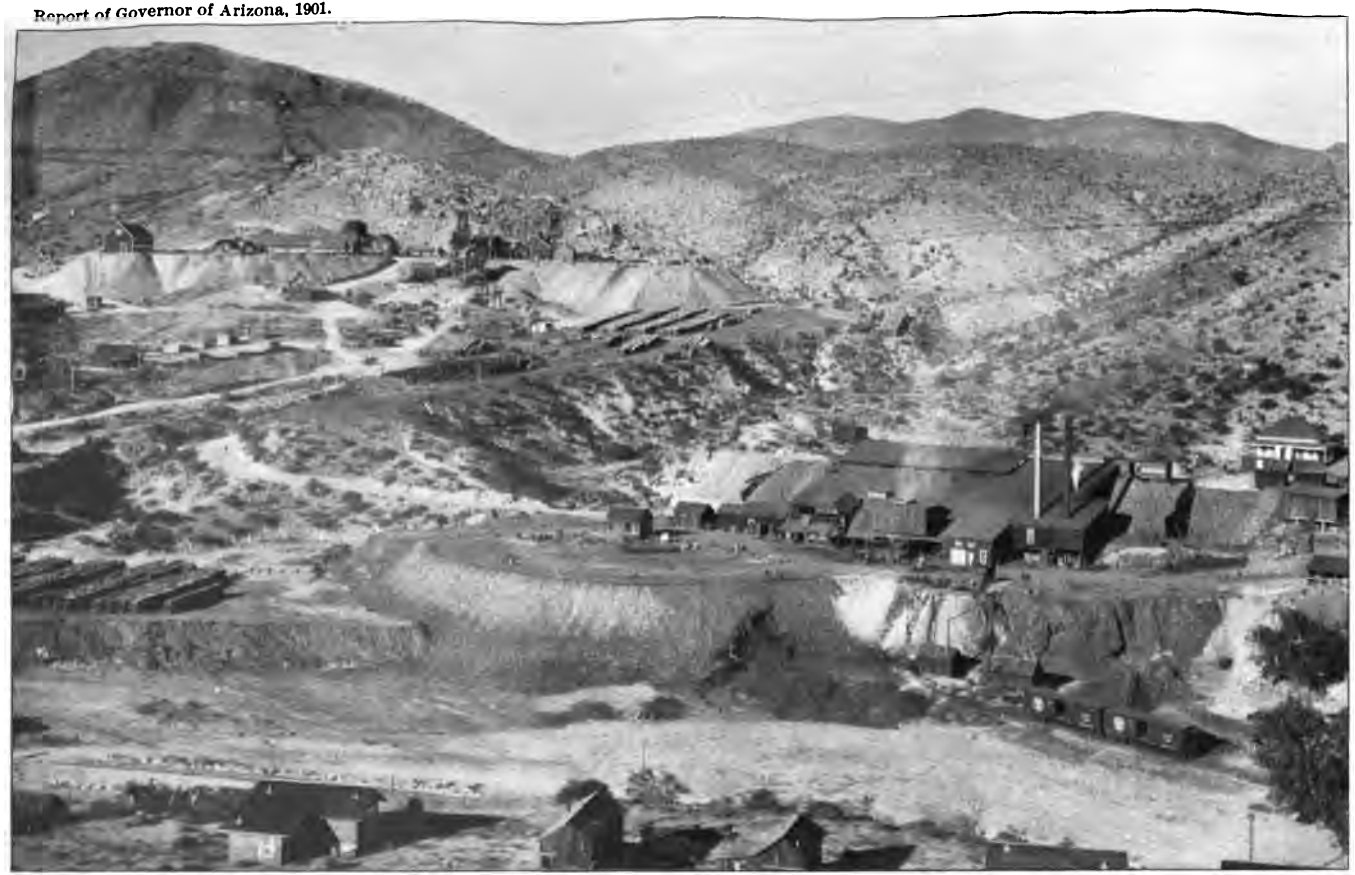
Cheap electrical power would wonderfully stimulate the mining industry in that locality, and the reservoir company claims that it will develop a water power which will produce 10,240 horsepower, of which 6,768 horsepower can be transmitted electrically to Globe, 35 miles distant. I have received no estimate from the company of the cost of installing their electric power and transmission plant, but that it can be done at a cost not prohibitive of profitable operation I have no doubt.

During the past summer exhaustive investigations were made by engineers of the Geological Survey at this dam site with a view to determining definitely the location of bed rock, diamond drills being used for the purpose. The results were more than satisfactory. It was ascertained that at the deepest point bed rock is but 43 feet below the surface, and that over most of the area of the proposed dam the distance to bed rock is much less. The quality of the bed rock and of the walls of the canyon were found to be ideal for the construction of the dam required.

GRAHAM COUNTY.

Graham County, in the central eastern part of the Territory, contains an area of 6,500 square miles. Its northwestern portion is covered by the White Mountain Indian Reservation. It is of rugged topography, with elevations varying from 2,800 to 10,000 feet. The Solomonsville Valley, from 2 to 5 miles wide, is the central part of the county. Through this valley, in which is located all the agricultural area of the county, flows the Gila River, the chief source of water supply. This river rises in New Mexico, crosses the eastern boundary of the county near its southern part, and flows northwest until it unites with the San Francisco River. The soil of the valley is a rich alluvium, very fertile, and under a high state of cultivation. The climate is mild, and almost any crop known to the western continent can be produced. The agricultural towns are Duncan, Solomonsville, Safford, Thatcher, Central, Pima, Bryce, Matthews, Eden, Fort Thomas, Geronimo; also Aravaipa, Fort Grant, Bonita, Wilcox, and Clifton. At Duncan the ditches belong to individuals, and are taken from the Gila River. The supply is usually plentiful for the land under cultivation, although a slight scarcity sometimes occurs in the latter part of May and lasts until the rainy season, about July 15. This scarcity could be prevented if only one ditch on each side of the river was used, or by the construction of a reservoir in the canyon. From Solomonsville to Geronimo canals, 25 in number and with varying lengths of from 1 to 15 miles, are taken from both sides of the river at intervals of a few miles.

Irrigation is entirely in the hands of the farmers and owners of the soil, and the ditches are owned by them under the cooperative system. When the title to real estate passes, the water right goes with it.



COPPER REDUCTION WORKS, GLOBE.

IRRIGATING CANAL, MARICOPA COUNTY.

Among these ditches is the San Jose—built in 1875, rebuilt in 1899—8 miles in length, and cost $20,000. It is constructed through a cement and gravel formation for the entire distance, and is probably one of the finest canals in the Territory. The Montezuma ditch is 8 miles long and cost $25,000. The Central, built in 1873, is 9 miles long, and cost $4,800. The Oregon Irrigation Company's ditch, having a length of 8 miles, cost $5,000, and the Smithville, 6½ miles long, cost $2,500. The Enterprise ditch, now under construction, will be 36 miles in length, and will irrigate 50,000 acres when completed. One mile only as yet has been constructed. At Bonita a private ditch, taken from Fort Grant Creek, has a length of 2 miles, cost $500, and in 1899 irrigated about 250 acres, which produced 500 tons of wild hay. Its area was considerably less than usual, as in some years over 1,000 acres have been irrigated by this ditch. The shortage was due to the light snowfall on the adjacent mountains. There are reported to be numerous reservoir sites along the line of the creek, and if they were used the normal precipitation on the surrounding mountains would be sufficient to reclaim several thousand acres of good land now of no value. Mount Graham, a lofty peak, is covered with snow every winter, and, under the present condition, when it melts the greater part goes to waste.

In order to bring a large area under cultivation, it will be necessary to construct reservoirs to increase the water supply. There are probably a number of available sites, as all the streams flow through canyons and valleys. Among them is one above the Kempton ditch, where, at an estimated cost of $15,000, a dam could be built that would store during the flood season a supply sufficient for 5,000 acres.

In several places it has been found practicable to increase the supply by artesian wells. A large area has been reclaimed during the past year by this method. All methods of irrigation are practiced, according to the topography of the land, character of soil, and kind of crops. Irrigation is reported in certain places as having resulted in bringing alkali to the surface. In some instances it has increased the deposits of alkali, while in others, in very bad alkali lands, it has improved the soil by carrying the alkali into the porous subsoil.

The ditches are put in condition about the 1st of January, water is turned into them in March, and the flow continues until the following January. Much sediment collects during the summer rains, and aquatic plants grow rapidly, necessitating the cleaning of the ditches at least once a year, and frequently four or five times.

MARICOPA COUNTY.

Maricopa County, in the central part of Arizona, contains an area of 8,816 square miles, and is slightly larger than Massachusetts. Within its boundaries, principally in the valleys of the Salt and Gila rivers, is located more than one-half of the irrigated area of the Territory. The Salt River, after crossing the eastern boundary of the county, flows southwest and unites 20 miles below Phoenix with the Gila. The valley through which it flows is estimated to be 60 miles long and 15 miles wide. Its surface appears level—broken only in places by isolated mountains and peaks—but in reality it has a gradual slope toward the west. This uniformity of surface is of great advantage, as water can readily be diverted at almost any part of the river's course and carried diagonally away from the stream, covering in the course of a few miles a considerable extent of coun-

try, almost every portion of which can be readily brought under tillage. The farms are in a high state of cultivation. The water carries a large percentage of sediment, which is incomparable as a fertilizer. The dark, rich alluvial soil is claimed to be admirably adapted to the growth of alfalfa, wheat, barley, all kinds of vegetables, sugar cane, melons, etc., while the gray, sandy loam of the mesas for the production of oranges, lemons, grapes, figs, nectarines, apricots, etc., is unexcelled. The climate is semitropical. Summer heat sets in earlier, is more intense, and lasts longer than in localities of the same altitude nearer the sea. The summer extends from June to September.

In 1897 a gauging station was established at McDowell, and since that time the water in both the Salt and Verde rivers has been measured. The data given in the following tables are the result of daily measurements made by the Geological Survey for the year 1899, from January 1 to November 11, inclusive:

Estimated monthly discharge of Salt River at McDowell, Ariz.

[Drainage area, 6,260 square miles.]

Months.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
1899.						
January	810	265	379	23,304	0.06	0.07
February	485	350	406	22,548	.06	.06
March	650	426	505	31,051	.08	.09
April	625	475	585	34,810	.09	.10
May	500	215	324	19,922	.05	.06
June	530	173	219	13,031	.03	.03
July	1,500	165	472	29,022	.08	.09
August	3,500	175	706	43,410	.11	.13
September	1,300	175	316	18,803	.05	.06
October	785	168	269	16,540	.04	.05
November	226	165	213	12,674	.03	.03
Total				265,115	.68	

A table of the discharge in other years is given in the article on Gila County, in connection with the description of the proposed storage reservoir in the Tonto Basin.

Estimated monthly discharge of Verde River at McDowell, Ariz.

[Drainage area, 6,000 square miles.]

Months.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.
1899.						
January	560	295	350	21,521	0.06	0.07
February	375	295	344	19,105	.06	.06
March	325	225	260	15,987	.04	.05
April	230	170	205	12,198	.03	.03
May	210	118	152	9,346	.03	.03
June	230	118	152	9,045	.03	.03
July	1,400	118	365	22,443	.06	.07
August	2,170	100	434	26,686	.07	.08
September	2,500	135	357	21,243	.06	.07
October	3,770	160	549	33,757	.09	.10
November	250	235	249	14,817	.04	.04
Total				206,148	.57	

PALM ROAD, BARTLETT RANCH, MARICOPA COUNTY.

GRAPES.

The supply of water in 1899 was much below the average. It has been estimated that the combined daily flow in the canals in this valley for the year prior to October was 10,000 miners' inches less than the average daily flow for the five years preceding. The rainfall was also smaller, consequently the conditions were not favorable for an average crop. For the previous six or eight years there had been a steady increase in the area under cultivation, but the data obtained for 1899 indicate that the acreage irrigated in that year was not as large as usual, and that the yield was materially lessened. On the irrigated land producing one crop of grain or alfalfa the yield was 25 per cent, while on that maturing two or more crops it was from 40 to 50 per cent less than in the preceding year. The measurements of these streams (the Salt and Verde rivers) for the years 1900 and 1901 have shown a much larger flow, there having been great floods in each year, but the exact figures have not been furnished to this office.

The principal canals of Salt River, Maricopa County.

Name.	Year first used.	Length in miles.	Average width in feet.	Capacity in second-feet.	Cost.
NORTH SIDE.					
Arizona Canal	1886	47	40	1,000	$1,000,000
Grand Canal	1878	26	20	215	25,000
Maricopa Canal	1868	20	18	150	20,000
Salt River Valley Canal	1868	20	15	150	20,000
Farmers' Canal	1871	14	19	.....	75,000
St. Johns Canal	.....	12	.....	.....	.....
SOUTH SIDE.					
Highland Canal	1890	24	16	100	120,000
Consolidated Canal	1891	33	40	1,000	(1)
Mesa Canal	1877	10	15	175	150,000
Utah Canal	1877	11	17	175	40,000
Tempe Canal	1870	30	40	337	150,000
San Francisco Canal	1871	12	10	52	15,000
Broadway Canal	1886	10	8	7	(1)
Marmonie Canal	1887	6	15	.....	6,000

[1] Not given.

For the economical administration of their business the first four canals on the north side of the river have been placed under the control of the Arizona Water Company, although each company retains its corporate existence. The Arizona Canal heads 1 mile below the confluence of the Salt and Rio Verde. The water is diverted into it by means of a 900-foot dam built of timber and stone, which extends diagonally across the stream. The head gate of the Grand Canal was washed away in 1899, and since that time it has received its water from the Arizona Canal.

The Maricopa and Salt River Valley canals, which head 5 miles east of Phoenix, have a joint dam of brush and stone across the stream and a joint head for one-half of a mile, where the division gates are located. The length of time water is furnished to users under these four canals depends upon the amount in the river. When the supply is plentiful the consumers are entitled to a continuous flow, and in summer, when the water is low, runs are rotated between the canals, giving larger heads for shorter periods. All the water is turned into the Arizona and Maricopa for four days; then into the Grand and Salt for an equal length of time.

The Farmers Canal heads 3½ miles below Phoenix. Ten years ago it was enlarged to its present size. Because of the drought of the

last few years no crops were irrigated by it, but formerly both cereals and alfalfa were produced.

The Consolidated Canal on the south side of the river is in reality an enlargement of the Mesa for a distance of 8 miles, over which the Mesa Canal Company has no jurisdiction. No land is irrigated directly by it, for it is used chiefly as a supply canal for the Utah, Mesa, and Tempe.

In addition to the canals given in the above table, there is the Meridian Canal now under construction. It is designed to be 10 miles long, 12 feet wide, and the cost, it is estimated, will be $16,000. Three and one-half miles have been completed.

In the larger canals water is measured by weirs, or in flumes. For grain and alfalfa the chief method of irrigation is by flooding, occasionally using borders to confine the water; furrows and basins are used for orchards and gardens.

Salt River carries a notable quantity of mineral matter in solution, but it is claimed that only in places along the lowlands has irrigation resulted in bringing more alkali to the surface than formerly. In canals where the current is sluggish a so-called moss collects, plants grow rapidly, and sediment is deposited, necessitating, in the majority of cases, cleaning twice each year. The usual method of cleaning is by shovels and scrapers.

The next largest irrigated portion of the country is the Gila Valley, in which Buckeye and Gila Bend are the principal towns. The canals are as follows:

Principal canals of Gila River, Maricopa County.

	Year first used.	Length in miles.	Average width in foot-seconds.	Capacity in cubic feet per second.	Estimated cost.
Buckeye Canal	1886	28	16	300	$80,000
Enterprise Canal	1886	12	14	100	10,000
East Riverside Canal	1893	20	17	675	125,000
Lower Gila Bend Canal	1885	20	15	250	25,000
Aztec Canal	1885	14	12	250	6,000
Palomas Canal	1887	22	15	60	10,000

In addition to the canals named above is the Arlington, recently constructed. It heads 4 miles southwest of Buckeye and is 15 miles long and 14 feet wide. Its cost is estimated at $12,000.

For the last two years no water has been diverted into the Aztec Canal. A conflict between the users in times of scarcity and a lack of system in the division of water has resulted in expensive litigation. The canal was abandoned, with the result that the alfalfa fields and orchards have perished. The ranchers still keep up their assessment work on the canal in order to maintain its franchise.

The Lower Gila Bend Canal has not been in operation for severel years, but is being repaired, and irrigation will be renewed.

The Palomas Canal might properly be considered in Yuma County, since most of the land irrigated by it is located there.

The supply of water in the Gila River is usually sufficient for the land under cultivation. The crops produced are alfalfa, wheat, barley, corn, and vegetables. The chief method of irrigating hay and grain is by flooding with borders 25 to 40 feet apart and from 300 to 600 yards long. The farmers claim that irrigation has not resulted in an increase of alkali, but, on the contrary, the soil has often been

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improved. Sediment collects in the ditches, necessitating cleaning once each year, the cost of which is from $1 to $2 per acre. There are several sites for reservoirs above the valley, and these must be utilized if the agricultural area is to be notably increased. The losses by drought in 1899 exceeded the estimated cost of providing water storage.

Among the canals in the other parts of the county is the Rio Verde Canal, partly constructed, and taken from the Rio Verde. It is designed to be 140 miles in length, 49 feet wide, and its cost is estimated at $2,000,000. A quarter of a million dollars has already been expended in the preliminary work of construction, including cost of surveys. A tunnel in rock 715 feet long, with open-cut approaches 60 feet high, and a total length of 400 feet, and 25 miles of canal have been completed.

The Agua Fria Canal and reservoir, taken from the Agua Fria River, is also partly constructed. Its total length will be 30 miles, width 45 feet, and cost, including reservoirs, $900,000. All the water in the river, estimated at 375 feet per second, is claimed by this company, and the number of acres that can be irrigated by the canal when completed is placed at 150,000.

Individual ditches are taken from both the above-named rivers, from Agua Caliente Springs, Cave Creek, from a well at Coldwater that taps the underflow of the Hassayampa River, and from other springs, principally in the vicinity of Cave Creek.

MOHAVE COUNTY.

Mohave County, in the extreme northwestern part of Arizona, is the second largest county in the Territory, having an area of 13,421 square miles. That portion lying north of the Colorado River forms a high plateau crossed by small mountain ranges. South of the Colorado River the surface is broken by ranges of mountains trending from the northwest to the southeast. Between the ranges are the valleys of the Hualpai and Sacramento, each about 100 miles long, with an average width of 3 miles. The soil in these valleys is fertile, and the entire area would be valuable for agricultural purposes if it were possible to develop a water supply. At the present time but little water is available, and the area irrigated in the county is small, being confined to tracts along the Big Sandy River on the southeast, the Rio Virgin on the extreme north, and small farms supplied by wells and springs in various parts of the county. It has been estimated that with sufficient capital several million acres in this county might be reclaimed. Among the plans proposed are the construction of reservoirs in the mountains and a utilization of the Colorado River to generate power for pumping water on the uplands. The Colorado River carries at all times a large quantity of water, but, owing to the great depths to which the river has eroded below the surface of the arable land, it will be difficult to utilize its water for irrigation purposes.

The Big Sandy is a small stream in the southeastern part of the county flowing in a southerly direction, and the ditches taken from it are small, rarely exceeding a mile in length. Each farmer takes out a ditch to irrigate his own tract of land. The water is diverted into them by temporary dams constructed of brush and sand that must be replaced each time a freshet occurs. The towns in the valley of this stream are Hackberry, Owens, and Signal. The supply is seldom sufficient for the land under ditch. If means could be found to increase

the amount of water, several hundred acres of good land could be brought under cultivation. It is suggested that this might be effected by the construction of reservoirs, for which sites are reported, though none of them have been utilized. During the winter there is abundant water in the springs, but it percolates through the sandy creek bed very rapidly. The next largest area irrigated is in the vicinity of Littlefield. Five ditches, all small, are reported as taken from the Rio Virgin. There is water in the river, if it were taken out upon the bench land, sufficient to irrigate 1,200 to 1,500 acres additional. Such an undertaking, however, would require considerable capital, more than could be expended by the settlers. Water is obtained also from springs, and the supply is abundant for all the land now irrigated. At Peach Springs, Chloride, and Kingman a few acres, mostly in gardens, are irrigated by wells, but the water supply is scant.

At Mohave City, on the Colorado River, the Government has a pumping plant that can supply water for 100 acres.

All the cereals, vegetables, and fruits of the temperate and semi-tropical zones can be successfully cultivated in this county. Several acres of cotton are reported as having been grown in 1899.

NAVAJO COUNTY.

Navajo County was formed in 1895 from the western portion of Apache County. It is 240 miles long, 53 miles wide, and comprises an area of 9,826 square miles, nearly equal to that of the land area of Maryland. More than one-half of the county, or 5,415 square miles, is appropriated to the Indians, the Moqui and Navaho Indian reservations covering the northern half and the White Mountain Reservation extending into the southern portion. For the greater part it forms a high plateau with an average elevation of 5,000 feet, being broken by small mountain ranges which attain their greatest altitude in the northern and southern portions. The Little Colorado River flows in a northwesterly direction across the central part of the county. This river and two of its tributaries, the Showlow and Silver creeks, form the chief source of water supply, and it is in the valleys traversed by them that practically all of the irrigated area is situated.

The county possesses a mild climate and a fertile soil. From the experience of farmers, it is stated that the loam soil requires about 2 feet and the clay 2½ feet of water for thorough irrigation during an average season. There is always a scarcity of water, especially during the latter part of the season. This could be prevented by the construction of reservoirs. In various parts of the county are dry washes which at certain seasons have large quantities of water. Among the sites reported are one above Holbrook, one above Showlow, another near Winslow, and several others in various parts of the county. The locations are regarded as favorable, and at a reasonable expense these reservoirs could be constructed and several hundred thousand acres of land capable of producing abundantly all kinds of cereals, hay, vegetables, and fruit could be added to the productive area of the county.

Ditches are reported at Snowflake, Taylor, Winslow, Woodruff, St. Joseph, and Showlow. The farmers at Showlow and Taylor are supplied with water from the same system, which comprises four ditches known as the East and West Snowflake and the East and West Taylor The ditches have a combined length of 12 miles and cost, including the reservoirs, about $20,000.

APRICOT ORCHARD.

At Winslow, the next largest irrigated section in the country, the water is taken by the Sunset ditch from the Little Colorado River. The farmers do not obtain all the water needed, as there is usually a scarcity in May and June. The principal crops are wheat cut for hay, and alfalfa. The Hallet ditch, taken from the Little Colorado and Silver Creek, supplies the water to the farmers in the vicinity of Woodruff. It is never sufficient for a full irrigation, as the Little Colorado River carries little water except during the rainy season, and the water in Silver Creek is appropriated at Snowflake, 21 miles south of this place. The creek comes through a box canyon from Snowflake, and the water is raised by a dam of rocks and timber 35 feet high. The ditch is taken out through a rock cutting 250 feet long, averaging 8 feet in depth, and is divided into four streams that water hundreds of acres of land. Because of the floods, the dam at this place has been washed out eight times since 1877. The crops produced under this ditch are cereals, vegetables, alfalfa, and fruits, such as peaches, apples, pears, apricots, and cherries.

The upper and lower branches of the St. Joseph ditch take water from the Little Colorado River, and supply the farmers of St. Joseph. This ditch is 9 miles long, and the water is diverted into it by means of a dam of brush, stone, and wood extending across the stream. There is constant complaint of scarcity of water in June, July, and August under this ditch, and the construction of a reservoir to hold the ordinary flow during the winter will probably furnish all the water that is needed by the present irrigators. Owing to the immense amount of sediment and detritus carried in solution by the Little Colorado during the flood season, it is impracticable to use it to fill the reservoirs along the river during that period; but there is plenty of water in the river to fill them in time of low water.

In the vicinity of Shumway and Showlow are two small ditches, one receiving its water from Silver Creek, the other from Showlow Creek. At Pinedale, Linden, and Heber small areas are cultivated and crops are grown without irrigation.

There are two instances reported of water being sold, one by miner's inches and the other at a certain price per acre. Irrigation is accomplished both by flooding and furrows. In places where alkali has appeared, irrigation seems to have destroyed it. A shortage of water is reported. By the construction of reservoirs, for which there are several available sites, this deficiency could be supplied. The ditches are open most of the year, and owing to a large amount of sediment it is necessary to clean them annually and sometimes oftener.

PIMA COUNTY.

Pima County occupies the central part of the southern border of Arizona adjoining Mexico, and contains an area of 9,424 square miles. The altitude ranges from 600 feet above the sea level on the mesas adjoining the Sierra del Ajo to 10,500 feet in the Santa Catalina and 11,500 feet in the Santa Rita Mountains. Its topography is greatly diversified, and may be conveniently described by dividing it into mesa land, foothills, and mountains, mesas and mountains alternating. The mountains rise abruptly out of the mesas, while the foothills, composed of disintegrated débris washed from the mountains, encircle their bases.

Irrigation in Pima County, as now conducted, is practically of no consequence, as the water supply is not sufficient for the land under

cultivation. There is probaly enough during the months of December, January, and February for the winter crop and for alfalfa, but there is always a scarcity in April, May, June, and July, when most needed. With approximately 6,031,360 acres in the county, a conservative estimate would give at least one-half of that area to mesa land, highly productive and arable, and, save in a few areas, free from alkali. The problem of providing a water supply is a very difficult one. It is impracticable to construct large irrigation works and storage reservoirs, as there are believed to be few, if any, storage sites, and the extreme dryness of the air would cause too great a loss by evaporation.

The irrigated areas are to be found along the river bottoms of the San Pedro, Santa Cruz, and Rillito, in the vicinity of Tucson, Redington, Mesa, Arivaca, and Pantano. Among the ditches on the Santa Cruz River that have been reported are the Allison Brothers', receiving its water from the seepage or underflow of the river, and which has a length of 4 miles, and cost $4,000; the Santa Cruz, 3 miles long, and cost probably $3,000, and the Rillito, 2 miles long, cost, $600. Near Pantano the Crane and Fraker ditch is taken from the Cienega Creek or Pantano wash. It is 2 miles long and cost $3,000. The Los Angeles ditch, 2¾ miles long, receives its water from the San Pedro River, near Redington, and cost $200.

PINAL COUNTY.

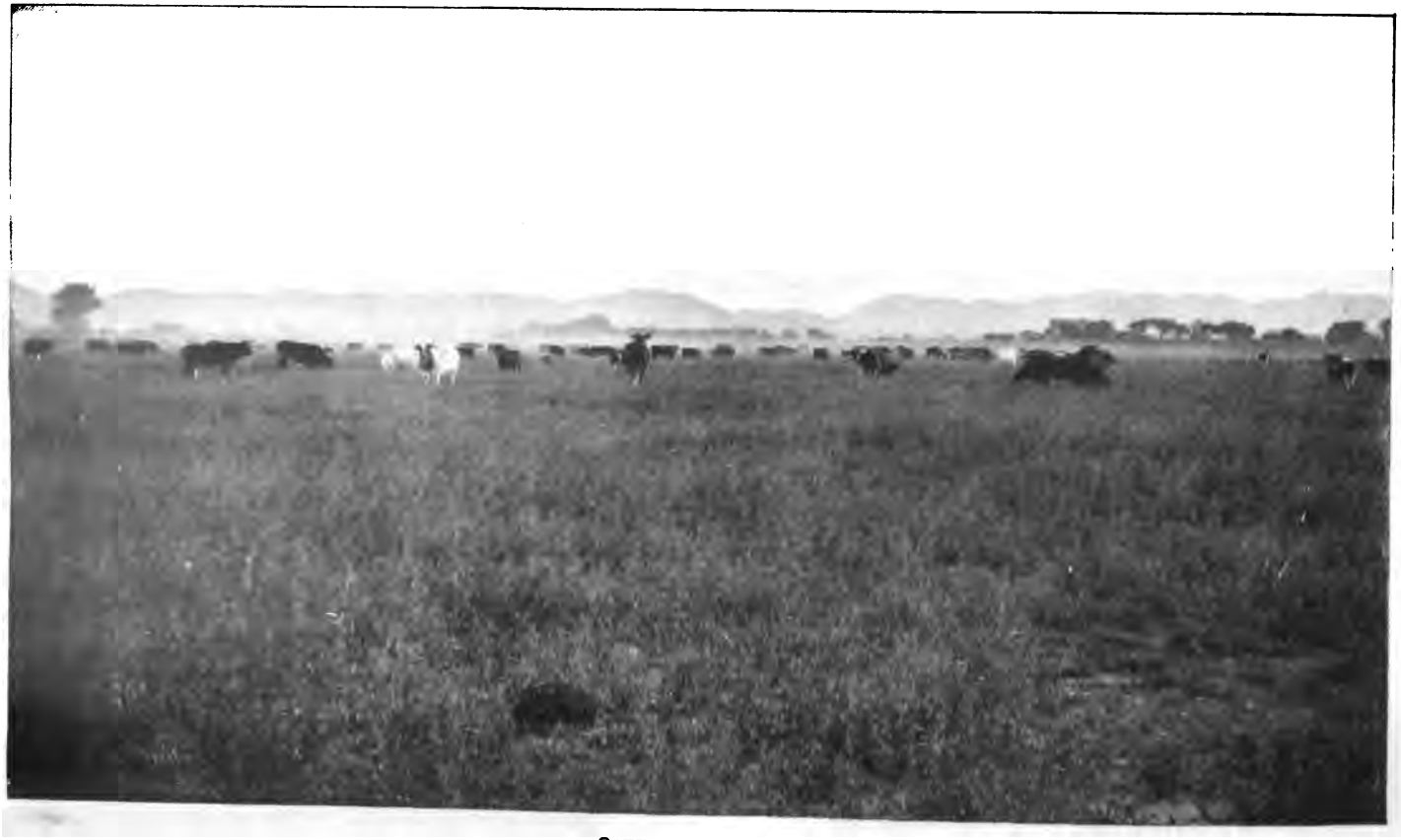
Pinal County, in the central portion of Arizona, contains an area of 5,324 square miles. The land now cultivated is mainly in the vicinity of Florence, along the Gila River, below the point where it cuts a transverse range of hills and mountains. Above this point, along and below the mouth of San Pedro Creek, is a second district which is irrigated by water obtained from the creek at various points above the town of Dudleyville and also from the river below that place.

Fifteen miles above Florence, at a point known as the Buttes, a gauging station is established, and the amount of water is measured daily by the Geological Survey. The result of these measurements in 1899, for the months from January to September, inclusive, is given in the following table:

Gila River at Buttes.

[Drainage area, 17,834 square miles.]

Months.	Discharge in second-feet.			Total for month in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Depth in inches.	Second-feet per square mile.
January	800	170	318	19,552	0.0209	0.0178
February	550	125	239	13,273	.0135	.0130
March	155	100	131	7,993	.0080	.0070
April	100	20	62	3,689	.0040	.0036
May	38	4	18	1,107	.0010	.0010
June	30	1	5	307	.0003	.0003
July	8,700	0.2	1,188	73,060	.0767	.0666
August	4,100	60	672	41,307	.0437	.0376
September	10,187	24	733	43,622	.0460	.0411
Total				203,910	.2141	



CATTLE AND ALFALFA.

By comparison of measurements in preceding years, made by the Geological Survey, and from reports made by settlers, it is apparent that 1899 was a dry year as regards rainfall and the amount of water in the stream, probably the driest experienced in the last ten years. The acreage irrigated that year was smaller than usual, yet from examination of the preceding table it is evident that had the supply which ran to waste been utilized, there would have been sufficient water for all the land under ditch, and for a large acreage additional. Several reservoir sites have been reported, notably those at the Buttes and San Carlos.

Before the construction of ditches above the reservation, the Pima, Papago, and Maricopa Indians, who irrigated and cultivated 1,000 acres of land, were in no wise dependent upon the National Government. The agricultural growth of the Gila Valley above the reservation has been disastrous to the Indians. By the diversion of water from the Gila into the several canals recently constructed, their supply of water has been greatly diminished, and they have been unable to obtain sufficient for their needs.

The ditches taken from the Gila are the following: Winkelman, Burns & Barrett, Arthur, Casagrande or Florence, McClelland, Sharp, Brady, Adamsville, Pierson, and Swiss.

The largest of these is the Florence, which is 47 miles long, has an average width of 20 feet, carries 3,000 miners' inches of water, and cost probably $500,000. It is reported that the company has allowed the canal to become filled with sediment until it does not now carry water enough for half the land under cultivation. There is no indication of an improvement in these conditions, and without a change many fine farms and homes will have to be abandoned. In good years, under this ditch, farmers often cut seven crops of alfalfa.

Irrigation is successfully practiced in several places in the valley of San Pedro in the eastern part of the county. The following ditches have been reported as taken from the stream: The Swingle & Young; the Scott, Cunningham & Selleck, which is 2 miles long and cost $600; the Lattin, the Brown, the Cook—which is 2 miles long and cost $2,500—and the Pusch.

During the months of May and June of each year there is very little surface water in the San Pedro River.

A number of small ditches are taken out of Aravaipa Creek, a tributary of the San Pedro River. The creek rises in the White Sulphur Valley, in Graham County, and flows through a narrow canyon nearly 20 miles. At various points the canyon widens and small tracts of land are irrigated. The creek carries considerable water at all times, and during the summer months its flow is said to be greater than that of the San Pedro River.

Only one small ditch, the Ramirez, has been reported from the Santa Cruz, a small stream in the south-central part of the county. The ditch is only 1 mile long, but last year irrigated 200 acres.

Around Redrock the Santa Cruz River is dry until June, July, or August, then the overflow is conveyed to the land, when beans, corn, pumpkins, and melons are planted. If a good overflow comes during that period the soil will produce wheat and barley from November to March. Very frequently two crops are raised in the year. In the vicinity of Oracle the outlying country is taken up largely with cattle and sheep ranches. There are neither canals nor ditches in this locality. The water is obtained from wells sunk in granite rock, and is found at from 30 to 50 feet from the surface.

In the vicinity of Sacaton, on the reservation, there are ten ditches of small dimensions, taking water from the Gila, and owned and constructed by the Indians. These ditches supply water to the farmers of three villages, containing 586 families.

Conditions throughout the county, with the exception of a few favored sections, were generally unfavorable to a large agricultural development without water storage, owing to a scarcity of water in May, June, and July.

Irrigation is practiced mainly by checks and in a few cases by furrows between borders. Where alkali was noticeable the soil has generally improved with the application of water. The ditches are kept open most of the year and collect a great deal of sediment. The growth of vegetation makes an annual cleaning necessary.

SANTA CRUZ COUNTY.

Santa Cruz, the last county organized in Arizona, was created in 1898, from the southeastern portion of Pima County. It is the smallest county in the Territory, and contains an area of 1,212 square miles, or about equal to that of the State of Rhode Island.

The topography is greatly diversified and broken by the San Rita, Santa Atascosa, Patagonia, Canille, and by other ranges of mountains. One of these, the Santa Rita, attains an elevation of 11,500 feet above sea level.

Irrigation is reported near the towns of Nogales, Calabasas, Patagonia, Crittenden, and Lochiel. The supply of water is obtained chiefly from the Sonoita and the Santa Cruz rivers. The latter, rising in the Canille Mountains, flows south into Mexico and then northwesterly through the central portion of the county. The Sonoita has its source in the northeastern part, and, flowing southwest, unites with the Santa Cruz at Calabasas.

The largest irrigation system that has been reported is that of the Calabasas Irrigation, Land and Water Company. The water for the canal is taken from the Sonoita and Santa Cruz rivers, and is diverted by three or four temporary dams into the main canal. The canal is 12 miles long, although at present only 5 miles are in actual use. The cost of the system was $10,000, and the number of acres designed to be irrigated by it was 3,000. The supply is not sufficient for the land already under ditch, and this scarcity is especially notable in the months of April and May. It is estimated, however, that by the expenditure of $25,000 for the construction of dams to impound the flood waters, 10,000 acres could be brought under cultivation. Other small ditches owned by individuals and taken from the Sonoita River are reported at Patagonia.

The soil is very fertile, and with plenty of water could easily produce two crops a year, but the supply of surface water is not sufficient for the land already under cultivation. The flow in neither the Sonoita nor the Santa Cruz is continuous, and it is only during the flood season that either of these streams deserves the name of river. Reservoir sites are reported, in which, it is claimed, the floods which result after the rainy season, from late summer to early fall, could be cheaply stored. The objection to the reservoir system is the great loss resulting from evaporation during the hot season. The supply of underground water seems to be plentiful, and great benefit would, no doubt, result from the sinking of artesian wells.

YAVAPAI COUNTY.

Yavapai County contains 7,863 square miles, or an area larger than that of New Jersey. In configuration it is rough and mountainous, and within its borders are few rich and fertile valleys, and these are generally narrow and of comparatively small area. The elevations vary greatly, the lowest valleys being 1,200 feet above sea level, while the highest mountains rise to an altitude of 10,000 feet a few miles south of Prescott.

There is an area of relatively large rainfall in the county, which is penetrated by the Verde, Agua Fria, and Hassayampa rivers, all feeders of the Gila. The Agua Fria is a dry stream, excepting after storms; but it carries a large volume of water during the flood season. The irrigable land is found mainly in the valleys along these streams and their branches, and the total acreage is small. The plains and mesa are generally covered with native grasses and afford excellent grazing for cattle. In seasons of abundant rainfall hay is frequently mowed from them.

In the settled agricultural sections the climate is excellent, being equable and healthful, with an atmosphere dry and rarefied. The principal irrigation district is in the Upper Verde Valley, where water is diverted from the Rio Verde and its tributaries, Oak, Beaver, Walker, and Clear creeks. Approximately 60 per cent of the irrigated area of this county lies in this locality, where there are numerous important ditches operated on the cooperative plan. Among the leading irrigation systems are the Verde Canal, which is 15 miles long, cost about $20,000, and irrigates 1,500 acres; the Lower Verde, 15 miles long, cost $12,000, irrigates 900 acres; the Reservation ditch, 7 miles long, cost $5,000, irrigates 1,000 acres; and the Central Verde, O. K., Pioneer, Eureka, Fain & Co., and Tipton ditches, all cooperative properties in this district.

Upon the solution of the problem of conserving flood waters depends the reclamation of numerous tracts of valuable land in the following fertile valleys: Agua Fria, Big and Little Chino, Williamson, Skull, Thompson, Kirkland, Santa Maria, Walnut Creek, Walnut Grove, Peoples, and Miller. Available and exceedingly favorable reservoir sites are numerous along the streams, but capital is lacking and only a small fraction of the land is now productive.

The irrigation ditches, with the exception of those mentioned, are, as a rule, small and of private ownership. The water in them is seldom measured and is usually divided in proportional parts to users, each person receiving a continuous flow. There are a few instances in which water is sold. Irrigation is mostly done by flooding and with furrows, though other methods are occasionally used for some crops. Sediment and water plants give some trouble and the ditches must be cleaned annually, in some places oftener.

There have been frequent storms, such as cloudbursts, rain, and hail, in the neighborhood of Jerome during the months of July and August, which have greatly damaged the ditches, crops, and fruit trees.

Around the town of Juniper the aggregate length of the ditches on Walnut and Apache creeks is about 5 miles, and the average cost per mile is about $50. There is an excellent site at the head of Walnut Creek, whereon a reservoir could be constructed to hold winter rain

and snow sufficient to irrigate 300 or 400 acres additional during the dry season.

At Yarnell the farming is done principally without irrigation, though the crops are generally very poor. The creeks and streams thereabout are usually dry, except during flood seasons, when the water rises in some places for a short distance, but is not enough for extensive irrigation.

YUMA COUNTY.

Yuma County, in the southwestern part of Arizona, has an area of 9,787 square miles. The Colorado River is on the western boundary, and the Gila River flows through the central portion in a westerly direction, uniting with the former at Yuma. Irrigation is practiced at Palomas, Mohawk, Somerton, Harrisburg, Aztec, Cibola, and Yuma, also in the Colorado Indian reservation, the small tracts being supplied with water chiefly from wells.

The largest canal taken from the Gila River is the Mohawk, which heads above the town of the same name. It is 23 miles long, cost probably $150,000, and covers between 25,000 and 30,000 acres. For several years previous to 1899 the canal was neglected and many of the farmers left the valley. In that year it was again put into condition, and the water supply having been plentiful, a small acreage was brought under cultivation.

At Yuma the rainfall is slight and the farmers depend either upon irrigation or the natural overflow of the river for the moisture required to produce crops. The principal system at present is that of the Yuma Valley Land and Water Company, a cooperative association of farmers. The water is pumped from the Colorado River at Yuma, but a gravity canal will be utilized in the near future. Including the main canal and laterals, the system comprises about 25 miles of ditches, and cost $20,000. An additional sum, estimated at $5,000, is to be expended before the system is completed. This canal is designed to water the valley from Yuma to the Mexican boundary, approximating 40,000 acres.

The Blaisdell Water Company is also located in the town of Yuma, and in addition to supplying the citizens with water for domestic purposes, it is stated that a system of ditches with a limited storage has been arranged for suburban irrigation.

The Arizona Improvement Company owns 10 or 15 miles of ditches supplied with water pumped from the Colorado River by usual methods, but the company is limiting its area of irrigation rather than increasing it.

The canal of the American Canal and Water Company is owned by individuals and is limited in capacity. By reason of its low heading it is capable of furnishing water to land under it only a portion of the year.

There are large tracts of good land along the banks of the Gila River, aggregating 30,000 acres or more, lying in the Mohawk Valley, but the water supply can not be depended upon and the rainfall is slight. The history of irrigation in the Gila Valley is full of expensive litigation, due to the continual contests in the courts over priority water rights. A number of canals on the Gila, near the headwaters, are being enlarged and new ones are taken out from time to time. As a consequence the periods of scarcity or of no water in the canals below are more and more prolonged each year. If this

condition continues it is only a question of time when the lower canals will become useless and farming under them must be abandoned. A system of reservoirs under proper control, and the storage and equitable distribution of water, offer the only effective remedy.

The supply of water in the Colorado River is always plentiful, but in order to utilize it for irrigation purposes it is generally pumped into ditches, since the level of the river is considerably below the surface of the arable land. To divert water from the river direct into canals is found to be expensive, and necessitates ditches of considerable length and depth. Despite these difficulties, extensive projects are well under way, and the acreage irrigated by water pumped from the Colorado River will be much greater each succeeding year.

The climate and soil of this valley are peculiarly adapted to fruits of tropical and semitropical varieties, and the future outlook is exceedingly promising. One of the largest irrigation canals in the world, having an average top width of 60 feet, is nearly completed, and in July of this year began delivering water to irrigators in the vicinity of Yuma, on the California side of the river.

Throughout the county the water is measured in the ditches by weirs, flumes, and gates, and is divided proportionately to users in a continuous flow. Irrigation is mostly by flooding, though furrows are sometimes used.

There is a box canyon on the Big Williams Fork on the northern border of the county which is estimated as carrying 3,000 inches of water, and which can be utilized as an excellent site for a reservoir. The sand walls in the canyon are 31 feet apart at bed rock and 63 feet between the walls at the surface of the water. It is stated that a dam could be built which would make a lake 7 miles long and 3 miles wide. The water could be used either in the valley on the other side of the canyon, in which are thousands of acres of placer ground, or in reclaiming a large tract of desert land on which could be raised almost any kind of crops. The estimate of the cost of such a dam is given as $250,000.

An important step in the agricultural development of Yuma County was the opening of the tract of land south of Yuma, known as the "Algodones grant," to settlement last spring under the land laws of the United States. This tract has been the subject of litigation for many years, and the final issue of the contest over the title was awaited with much impatience by settlers. When it was at last thrown open to public entry the best portion of it, comprising several thousands of acres, was settled upon at once and the reclamation of the land begun. There is a never-failing supply of water at hand in the Colorado River, and during the past summer a comprehensive system of irrigating ditches was placed in service. The occupation and clearing of the lands ready for cultivation consumed the earlier weeks of the crop season, but all of the tract to which water can be conducted readily is now under a good state of cultivation, and within another year will be the seat of a prosperous community. Upon this tract and the other agricultural lands in the neighborhood of Yuma, fruits are ready for market earlier than in any other portion of the Union, and this advantage is very important in the matter of prices. Alfalfa growing and stock raising being the quickest means of acquiring wealth, however, these industries are followed more generally at present.

AGRICULTURE AND HORTICULTURE.

[By R. H. FORBES, director experimental station, Territorial University.]

During the past year, as heretofore, agriculture and horticulture have shown steady growth in Arizona. With the increase of experience and of consequent skill in the handling of the present water supply, and with the rapid development of new regions, especially those tributary to the Colorado River above and below Yuma, the growth of agriculture in the Territory has resulted in the creation of a settled population secure against the excessive fluctuations of numbers and of values which are so often observed in purely mining communities. According to the last census report, the Territory possesses 5,809 farms, with an improved acreage of 254,521 acres. This acreage, though small in comparison with the great area of the whole Territory, on account of the great productiveness of these lands under irrigation, places agriculture at once in a commanding position among the industries of the Territory. The future development of the Colorado River and the more efficient administration of existing supplies, together with the possibilities of pumping when cheaper fuel shall be obtainable in the Territory, point toward the increase of agriculture in Arizona for many years to come.

The conditions of soil, irrigation, and climate combine to produce an uncommon variety and amount of marketable produce. The soils of Arizona, as is usual with the soils of arid regions, are rich in most of the elements of fertility, requiring only the ever-needful water, skill, and industry in their management to secure abundant returns. The fertility of cultivated soils in irrigated regions is further assured by the deposit of silt brought upon the land with irrigation water. The problems of fertilization, which become so serious in humid sections, are therefore of much less importance here and not to be so carefully reckoned with in connection with the future of our agriculture. The most marked advantage in connection with agriculture and horticulture, especially in southern Arizona, is the climate. From January to June the temperature resembles that of spring and early summer in the latitude of Kentucky. From June to September the climate is of subtropical fervor, while from September to November there is a second mild season of temperate weather. The winter season, from November to January, though subject to sharp frosts in southern Arizona, is not seriously or even uncomfortably cold.

Owing to this combination of seasons, a remarkable variety of crops may be found in the same locality at different times of the year. Strawberries, which flourish in Greenland, may be found on the same land with the date palm from Sahara. Alfalfa, the great forage of the arid West, flourishes alongside of wheat, corn, and sorghum, respectively characteristic of Minnesota, Illinois, and Kansas. Oranges, lemons, and olives from California may be found in the same neighborhood with peanuts and sweet potatoes from Virginia. In brief, many of the leading crops of both temperate and subtropical countries, which are not affected by a too arid atmosphere or by the frosts of winter, flourish in southern Arizona. In northern Arizona, where the temperatures more resemble those of northern Illinois, many more distinctively temperate-region crops flourish, such as potatoes, apples, and various small fruits.

When with this diversity of products is coupled a healthful and for the most of the year agreeable climate, it will be seen that agriculture in Arizona possesses distinct advantages.

STAPLE CROPS.

ALFALFA.

Probably the most important crop in Arizona is alfalfa. With from four to seven cuttings a year possible, it may be stated that probably nowhere in the United States does this plant yield more abundantly.

It has several values in our agriculture. First, as hay, there is a constant market, at good prices, in the adjoining mining country. During the past three years the short crop in California, with resulting high prices, has led to an annual output of hay from Arizona. This fact, among other things, illustrates the advantage of an irrigated region over one depending for crops upon rainfall. A more profitable use for alfalfa, ordinarily, is as a stock fattener. It is so employed in feeding hogs and cattle, also in connection with a growing dairy industry. It is estimated that during 1899 about $1,500,000 worth of alfalfa hay and fat cattle were exported from Salt River Valley. With improved methods of feeding, this output can doubtless be greatly increased.

With butter now being shipped into Arizona from Kansas it is also evident that there is yet room for the growth of the dairy industry. There are now three creameries and cheese factories in the Territory, with probably more to come in the near future.

Another very important use of alfalfa is as a soil renovator. Our semiarid desert soils are commonly dense, and deficient in humus and nitrogen—circumstances leading to a condition of poor tilth, which often makes successful culture of ordinary crops a difficult matter. Alfalfa, however, flourishes in these soils, and in so doing loosens them to considerable depths by means of its roots, and through its process of growth and decay contributes the much-desired humus and nitrogen to the soil. In this way alfalfa serves as a preparation for other crops; and it is a matter of common observation that orchards, wheat, sugar beets, and other crops all flourish best on ground which has previously been in alfalfa.

CORN.

It is only within the past few years that it has been known that fine crops of corn may be grown in the warmer regions of Arizona. Large crops of this product are annually grown on the upper Gila, in Graham County, and the acreage in Maricopa County is annually increasing. In order that the grain may properly fill, corn must be planted in July, or sufficiently late so that in maturing it will just escape the fall frosts. The poor varieties of Mexican corn formerly grown in Arizona are giving way to the improved white dent varieties from the North and East. Our seasons are sufficiently long to grow a crop of corn after harvesting a crop of wheat or barley.

In connection with alfalfa and together with other forages of like nature, corn will probably prove more valuable in helping to make out a more perfect ration for cattle. Sorghum, root crops, and Kaffir corn are likely to prove valuable for the same purpose. The experiment station is engaged in the study of methods of feeding, the improvement of which will result in the creation of large values in this industry.

WHEAT.

The acreage and amount of wheat produced in Arizona are increasing each year. It is largely a winter and spring crop, maturing before the extremely dry weather of summer, when water is scarce. Large and flourishing mills at Phœnix, Tempe, Tucson, Solomonville, Safford, and Thatcher are supplied by Arizona-grown wheat. The chief variety cultivated heretofore has been the Sonora wheat, but there is room for useful experiment in securing other successful varieties for Arizona, in order to obtain a better milling combination than is afforded by the Sonora wheat alone. The experimental work of the past three years at the station farm has developed at least three new varieties of wheat which compare favorably with the native Sonora wheat almost universally grown.

BARLEY.

Barley is chiefly grown in Arizona as a hay crop, being cut and baled for this purpose before maturity. Certain varieties of beardless and hull-less barley have recently been introduced in a few places and are attracting some attention. The yield of grain per acre is from 30 to 50 bushels.

ROOT CROPS AND VEGETABLES.

Many of the most important root crops thrive in Arizona. The common potato grows wild in certain parts of the Territory. In the northern valleys, where irrigation is possible, heavy crops of potatoes are grown. During the long, mild spring season potatoes may also be grown with marked success in the irrigated portions of southern Arizona. The chief difficulty in southern Arizona, however, is to preserve the potatoes after they are once grown, since in this warm section their tendency is to sprout and continue their growth shortly after maturity.

Sweet potatoes of excellent quality and in great quantity can be grown. Peanuts have also produced well, although their culture has as yet hardly passed the experimental stage.

Sugar beets and field beets yield abundantly if planted early enough in the year to mature before the extremely hot weather of midsummer.

Green vegetables in unusual variety may be produced if skillful attention is paid to the planting seasons. As mentioned above, three are two mild, temperate seasons in southern Arizona—one extending from January to June, the other from September well into November. Certain of the more quickly growing vegetables, therefore, may be made to produce both in the spring and fall, this double season being recognized by the more experienced residents of this section. Asparagus, beans, cabbage, cauliflower, carrots, celery, corn, cucumbers, egg plant, lettuce, melons, onions, parsnips, peas, radishes, spinach, squashes, tomatoes, turnips, and other varieties of vegetables in yearly increasing number are successfully grown.

Excellent information as to methods of culture are to be found in Bulletin 35 of the experiment station.

FRUITS.

In northern Arizona, where the climate is temperate in character, peaches, grapes, and apples of superior quality are grown, but only in small quantities, since the irrigated area in northern Arizona is only limited in extent. Apricots and grapes are grown and shipped in large quantities from Salt River Valley. Raisins are also produced in considerable amount in this part of Arizona. Oranges and lemons of superior quality are produced in Salt River Valley and near Yuma. They have the advantage of a season earlier than that of southern California, while, in addition, the fruit is uncomonly bright and attractive in appearance. This is due to the fact that the scale insects perish from the effects of the dry, hot atmosphere, leaving the fruit unmarred by their presence. Strawberries in skillful hands have proved a profitable crop in southern Arizona, the entire product being marketed in the Territory. Figs grow luxuriantly in southern Arizona, but require a constant and abundant supply of water in order to yield well. Almonds have been grown with varying success. The great drawback to their culture is the late spring frosts, which are so likely to destroy the crop. For the past three years, however, the growers have in most instances succeeded in warding off the disastrous frosts by smudging their orchards at critical times. During this time heavy crops of the highest market value have been secured, especially in the vicinity of Mesa City.

Olives are a promising crop in southern Arizona. This tree requires comparatively little water, and the scale, which is so abundant upon the tree in California, is not found upon it here. Experts state that the trees grown in Arizona are unusually bright and attractive in appearance and their fruit of good quality. The product of the olive tree also, either in the form of pickles or oil, may be held for the best market, and is of small weight and bulk in comparison with its value, shipping charges being thus economized. It is not improbable that this fruit has a growing future in this region, since the demand for olive products is at present, throughout the United States, far in excess of the supply.

SUGAR BEETS.

Experimental work with sugar beets has been continued by the experiment station during the season of 1901, and, for the present, brought to completion.

The final results of this investigation, which has continued for the past five years, appear in the following table, the work having been done almost entirely in Salt River Valley and upon the Gila near Safford and Pima.

Final results of experimental work with sugar beets.

AT EXPERIMENT STATION FARM, PHOENIX, SEASON OF 1900.

Plot.	Date sown.	Harvested.	Sugar in beets.	Purity.	Yield per acre.	Variety.
			Per cent.		*Tons.*	
1	Dec. 26	July 30	16.9	85.4	14.5	Kleinwanzlebener.
2	Jan. 23	....do...	13.7	83.0	10.4	Do.

IN THE VICINITY OF SAFFORD AND PIMA, SEASON OF 1901.

1	Feb. 6	July 25	11.45	79.3	29.82	K. W. from Chino.
2	....do...	....do...	10.45	77.4	38.36	Do.
3	Feb. 19	....do...	12.34	82.1	14.62	Do.
4	....do...	....do...	12.73	82.6	16.43	Do.
5	Jan. 31	do...	11.10	77.2	31.51	Do.
8	Feb. 26	July 22	12.97	85.5	13.0	Do.
9	....do...	....do...	12.48	81.9	13.75	Do.
10	....do...	....do...	14.40	85.1	11.84	K. W. from Austria.
11	....do...	....do...	14.0	82.7	13.48	Do.
12	....do...	....do...	14.81	84.5	11.33	Vilmorin from France.
13	....do...	....do...	14.78	85.5	14.23	K. W. from Russia.
14	....do...	July 23	13.64	83.0	13.80	Do.
15	....do...	....do...	14.47	84.6	16.15	K. W. from Germany.
16	....do...	....do...	12.57	83.7	19.98	K. W. from Chino.
17	....do...	....do...	12.31	82.8	15.86	Vilmorin from France.
20	....do...	....do...	10.60	78.0	19.78	K. W. from Chino.
22	....do...	....do...	11.39	76.9	22.50	Do.

These results are what should be expected with suitable skill on the part of agriculturists in the regions named. It is not improbable that even better results could be gotten in the smaller irrigated valleys of northern Arizona, but the lack of railroad communication has prevented investigation there.

Although the figures presented do not surpass those obtained on the coast, their value is augmented by the fact that in the irrigated regions of Arizona the crop would be much more certain than in some parts of California—for instance, where rainfall is depended upon. This is brought to mind by the experience of the past three years, during which the factories have missed at least two seasons' work because of drought, while in the irrigated sugar-beet districts of Utah production has been without interruption. Attention has, in consequence, been turned toward irrigated districts capable of producing sugar beets, and has led to a favorable disposition of manufacturers to such regions, the irrigated valleys of Arizona among the number.

THE DATE PALM.

One of the most attractive horticultural propositions in Arizona at the present time is date-palm culture.

It has long been known that this palm would grow and bear fruit in southern Arizona and Sonora; but it has remained for American enterprise to undertake to develop the full value of this useful tree.

The incentive to its development in this region may be understood when it is stated that the annual importation of dates into the United States amounts to about $400,000. Moreover, it is not only a palatable fruit, now mostly used as a luxury, but it is a most excellent food, especially suitable for hot climates. As a food the date is the chief dependence of men, horses, and camels in the desert regions of Africa and Arabia, and its use as a staple in the United States is capable of indefinite increase. For climatic reasons this demand can only be supplied from the dry, hot, irrigated valleys of southern Arizona and inland southern California.

The large shipment of African palms, consisting of over 400 trees in 28 varieties, received by the experiment station through the cooperation of the United States Department of Agriculture last year, are for the most part prospering in the date-palm orchard south of Tempe. After the driest summer and the coldest succeeding winter known for twenty years, it is found that 80 per cent of the palms are living and for the most part growing vigorously.

It is expected that in about three years these trees will commence to bear, and thus afford means for judgment as to their true value in their new surroundings. In this connection it is interesting to state that in the fall of 1900 three imported trees on the experiment station farm, 10 years old, bore over 500 pounds of dates, which readily sold at 25 cents a pound, wholesale; and at the present time a small tree, 5 years old, in front of the University building at Tucson, carries about 125 pounds of fruit.

MISCELLANEOUS PRODUCTIONS.

Bees produce an abundance of excellent honey in this region, depending in part upon alfalfa and in part upon the inflorescence of the mesquite, various acacias, and other wild vegetation. The Salt River and Gila valleys are stated to have produced $80,000 worth of honey in the season of 1899, largely shipped in carload lots to Eastern points.

Tobacco also may be grown under irrigation, but its culture has not as yet received expert attention. Much of the native product is worked up by local manufacturers, chiefly for the Mexican trade.

In general, it may be stated that the combination of temperate and subtropical characters in the climate of this region, together with the intensive methods consequent upon irrigation, have combined to make possible an extraordinary variety of agricultural productions, for which there exists a ready market in the surrounding mining districts. These facts, together with the experience necessary for success in a new region, combine to afford better than average returns to the Arizona farmer.

STATISTICS OF FARMS, FARM AREAS, RESOURCES, AND PRODUCTS.

The branches of agriculture that can be developed in Arizona, as elsewhere, are determined by the character of the soil and its relation to rainfall and temperature. In Arizona there is sufficient precipitation of moisture in the ordinary year to develop over a considerable portion of its surface an abundance of herbage for

flocks and herds, but not sufficient, save in exceptional cases, to guarantee the successful cultivation of cereals, vegetables, and fruits. As a result these crops, when grown, depend to a very large extent upon irrigation. The greater part of the water used for irrigation purposes is derived from precipitation inside the Territory. The success of irrigated crops in any given year is dependent upon the rainfall for that year. Small farms can not be opened and maintained save where the soil can be supplied with water from streams and wells. Along the valleys of rivers and streams, therefore, will be clustered the small farms exhibiting a high degree of cultivation, while the only agricultural industry that can be developed on the nonirrigable plains will be the keeping of flocks and herds. It is along the streams that are found the small owned farms of which mention has been made, while upon the nonirrigable plains are located the ranches, with flocks and herds, under the direction of salaried managers. Most of the surface of these plains still belongs to the public domain, although it is quite generally used for the feeding of flocks and herds.

LIVE STOCK INTERESTS.

The overshadowing importance of live stock in the agriculture of Arizona is seen in the fact that while the land, improvements, and buildings in 1900 had a reported value of $13,682,960, live stock had a reported value of $15,458,717, or nearly $2,000,000 more. The most important single source of farm income was that received from the sale of live animals. The amount thus received, after deducting sums expended in the purchase of domestic animals, was, in 1899, $1,908,745. The value of dairy products is $530,700; of wool, $424,158. These figures include reports from the Indian reservations as well as those from the farms and ranches of other farmers. The Indians in 1900 are reported as possessing live stock to the value of $1,283,288, and as having farm products in 1899, including sales of animals and wool, to the value of $198,789.

The progress is shown in the following exhibit, which gives for the census years beginning with 1870 the number of neat cattle and sheep, exclusive of calves and lambs, and the reported value of all live stock.

DAIRY COWS AND PRODUCTS.

The dairy interests are increasing in importance with every decade. The increase can be noted in the following facts: In 1890 the milch cows numbered 4,874; in 1900, 17,965. This is an increase of 268.6 per cent. The total production of milk in 1900 was 709,225 gallons, or 146 gallons per cow. In 1900 the total was 3,056,109, or 170 gallons per cow. The total production of milk increased 330.9 per cent.

MISCELLANEOUS CROPS AND CROPS OF RECENT INTRODUCTION.

Twenty-eight farmers in the Territory reported miscellaneous or unclassified crops to the total value of $5,510, without giving the acreage from which this income was derived. In the majority of cases the cash receipts reported represent money received in return for the pasturing of stock on unimproved lands. As the product of lands thus utilized could only be measured in cash receipts, no attempt was made to give acreage.

One farm in the Supai and Walapai Indian Reservation reported 92 acres of sunflowers, which yielded 1,000 bushels of seed, valued at $1 per bushel.

Three crops—cotton, hops, and broom corn—have been introduced into the Territory since the taking of the Eleventh Census, and in 1899 added somewhat to the gross receipts from agricultural products.

Eight irrigated farms in Mohave County reported in all 20 acres of cotton, which yielded 22,600 pounds in the seed. For this the planters received $814, a return of about $41 per acre.

Six hundred pounds of hops, valued at $21, were grown on two farms in Cochise County.

One farm in Graham County and three in Maricopa produced from 30 acres of land 21,100 pounds of broom corn, having a market value of $937.

TABLE 2.—*All farms, and farms of specified principal sources of income, June 1, 1900, classified by color of farmers and by area.*

Principal sources of farm income.	Total number of farms.	Number of farmers.		Farms classified by area.			
		White.	Colored.	Under 3 acres.	3 and under 10 acres.	10 and under 20 acres.	20 and under 50 acres.
The Territory	5,809	4,006	1,803	783	749	506	922
Hay and grain	2,052	1,152	900	184	305	233	400
Vegetables	302	138	164	35	104	26	29
Fruit	93	90	3	1	2	9	26
Live stock	2,343	1,794	549	505	262	156	258
Dairy products	472	469	3	16	24	40	121
Tobacco	1	1					1
Sugar	5	5					
Miscellaneous	541	357	184	42	52	42	87

Principal sources of farm income.	Farms classified by area.						
	50 and under 100 acres.	100 and under 175 acres.	175 and under 260 acres.	260 and under 500 acres.	500 and under 1,000 acres.	1,000 acres and over.	Average size, in acres.
The Territory	674	1,581	143	268	112	71	333.2
Hay and grain	300	457	56	76	30	11	89
Vegetables	26	64	3	11	3	1	73.3
Fruit	15	25		12	2	1	127.2
Live stock	190	668	57	133	65	51	685.9
Dairy products	75	158	14	16	7	1	102
Tobacco							40
Sugar	1	3		1			176
Miscellaneous	67	208	13	19	5	6	115.7

TABLE 3.—*Areas and values June 1, 1900, and expenditures in 1899 for farms of specified classes.*

Basis of classification.	Class of farm.	Number of farms.	Number of farms with buildings.	Values of farm property June 1, 1900. Total.	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.	Value of products not fed to live stock.
	Total	5,809	4,464	$29,906,877	$11,418,460	$2,266,500	$765,200	$15,458,717	$6,179,397
Tenure	Owners	4,784	3,546	16,578,658	6,281,050	1,442,490	543,990	8,311,128	3,215,647
	Part owners	191	186	2,459,616	1,263,200	128,460	51,230	1,016,726	706,120
	Owners and tenants	10	9	27,573	9,100	1,580	1,330	15,563	6,280
	Managers	335	273	8,897,021	2,701,230	536,860	104,540	5,554,391	1,887,010
	Cash tenants	300	282	1,306,530	710,060	90,870	39,040	466,560	226,510
	Share tenants	189	168	637,479	451,820	66,240	25,070	94,349	137,630
	Total	5,809	4,464	29,906,877	11,416,460	2,266,500	765,200	15,458,717	6,179,397
Race of farmer	White	4,006	3,604	27,846,550	10,791,640	2,225,780	692,830	14,136,300	5,941,491
	Chinese	18	18	36,759	27,730	3,540	2,115	3,374	25,542
	Indian	1,769	828	1,945,613	563,580	30,830	67,915	1,283,288	198,755
	Negro	16	14	77,955	33,510	6,350	2,340	35,735	13,609
Race and tenure	WHITE.								
	Total	4,006	3,604	27,846,550	10,791,640	2,225,780	692,830	14,136,300	5,941,491
	Owners	3,015	2,717	14,585,847	5,690,660	1,407,810	474,570	7,012,807	3,005,351
	Part owners	191	186	2,459,616	1,263,200	128,460	51,230	1,016,726	706,120
	Owners and tenants	6	6	25,603	7,700	1,500	1,170	15,233	5,920
	Managers	331	270	8,870,483	2,697,850	534,840	104,010	5,533,783	1,884,100
	Cash tenants	278	260	1,268,365	680,880	86,990	36,890	463,605	202,840
	Share tenants	185	165	636,636	451,350	66,180	24,960	94,146	137,160
	COLORED.								
	Total	1,803	860	2,060,327	624,820	40,720	72,370	1,322,417	237,906
	Owners	1,769	829	1,992,811	590,390	34,680	69,420	1,298,321	210,496
	Owners and tenants	4	3	1,970	1,400	80	160	330	360
	Managers	4	3	26,538	3,380	2,020	530	20,608	2,910
	Cash tenants	22	22	38,165	29,180	3,880	2,150	2,955	23,670
	Share tenants	4	3	843	470	60	110	203	470

	Total	5,809	4,464	29,906,877	11,416,460	2,266,500	765,200	15,458,717	6,179,397
Area of farm	Under 3 acres	814	216	2,375,551	114,160	68,960	37,920	2,154,511	618,761
	3 to 9 acres	718	407	497,751	119,310	57,940	30,110	290,391	96,526
	10 to 19 acres	506	411	648,240	216,990	89,080	29,230	312,990	130,230
	20 to 49 acres	922	779	2,017,134	1,032,870	317,620	88,510	578,134	366,260
	50 to 99 acres	674	599	2,478,128	1,291,360	284,730	97,990	804,048	472,960
	100 to 174 acres	1,581	1,491	7,901,482	2,915,550	829,530	238,940	3,917,462	1,566,160
	175 to 259 acres	143	134	1,196,528	628,750	83,580	44,160	440,038	240,460
	260 to 499 acres	268	257	3,393,875	1,518,140	230,630	88,080	1,557,025	752,680
	500 to 999 acres	112	107	3,510,146	1,216,040	129,190	47,110	2,117,806	729,320
	1,000 acres and over	71	63	5,888,042	2,363,290	175,290	63,150	3,286,312	1,206,040
	Total	5,809	4,464	29,906,877	11,416,460	2,266,500	765,200	15,458,717	6,179,397
Principal source of revenue	Hay and grain	2,052	1,534	5,161,763	3,548,652	547,600	267,410	803,101	1,322,430
	Vegetables	302	272	380,354	245,342	51,720	24,100	59,192	125,900
	Fruit	93	87	798,048	628,476	67,170	22,320	80,082	132,690
	Live stock	2,343	1,705	19,614,300	5,193,843	1,034,700	327,870	13,057,887	4,006,121
	Dairy	472	448	2,108,135	1,104,070	448,200	71,410	484,365	366,630
	Tobacco	1	.....	1,849	500	.....	100	1,249	450
	Sugar	5	5	12,954	10,263	1,230	550	911	1,740
	Flowers and plants	1	1	940	630	300	10	.....	200
	Nursery stock	2	2	24,714	18,500	5,250	350	614	3,699
	Miscellaneous	538	410	1,803,820	671,184	110,240	51,080	971,316	219,537
	Total	5,809	4,464	29,906,877	11,416,460	2,266,500	765,200	15,458,717	6,179,397
Value of products	$0	360	190	803,130	325,790	46,000	20,730	410,610	.....
	$1 to $49	825	331	518,080	226,580	37,640	36,790	217,070	20,736
	$50 to $99	669	457	526,620	284,750	45,790	27,400	168,680	47,240
	$100 to $249	986	776	1,797,200	851,590	232,160	78,450	635,000	159,900
	$250 to $499	833	769	2,007,640	996,080	281,660	86,090	643,810	222,800
	$500 to $999	844	760	3,158,152	1,498,190	335,620	117,960	1,206,382	501,037
	$1,000 to $2,499	783	714	5,660,000	2,458,540	507,480	183,700	2,510,280	961,887
	$2,500 and over	509	467	15,436,055	4,774,940	780,150	214,080	9,666,885	4,195,707
	Total	5,809	4,464	29,906,877	11,416,460	2,266,500	765,200	15,458,717	6,179,397
Irrigation	Irrigated farms	4,210	3,407	20,592,532	9,614,352	1,822,322	655,791	8,500,067	3,696,094
	Unirrigated farms	1,599	1,057	9,314,345	1,802,108	444,178	109,409	6,958,650	2,483,303

TABLE 3.—*Areas and values June 1, 1900, and expenditures in 1890 for farms of specified classes*—Continued.

Basis of classification.	Class of farm.	Average values of—						Total expenditures in 1899 for—		Average expenditures for—		Acres in farms.			
		Farm property June 1, 1900.					Farm products of 1899.	Labor, including board.	Fertilizers.	Labor.	Fertilizers.	Total.	Improved.	Unimproved.	Percentage of improved.
		Total.	Land and improvements.	Buildings.	Implements and machinery.	Live stock.									
Tenure	Total	$5,148	$1,965	$390	$132	$2,661	$1,064	$1,142,670	$3,871	$198	$1	1,935,327	254,521	1,680,806	13.2
	Owners	3,465	1,313	301	114	1,737	672	575,330	3,871	121	1	419,344	161,284	258,060	38.5
	Part owners	12,878	6,614	673	268	5,323	3,697	108,630	.....	569	.....	103,097	34,130	68,967	33.1
	Owners and tenants	2,757	910	158	133	1,556	628	250	.....	25	.....	676	319	357	47.2
	Managers	26,558	8,063	1,603	312	16,580	5,633	386,180	.....	1,153	.....	1,354,854	27,640	1,327,214	2.0
	Cash tenants	4,355	2,367	303	130	1,555	755	50,550	.....	168	.....	33,692	19,280	14,432	57.2
	Share tenants	3,373	2,391	350	133	499	728	21,730	.....	115	.....	23,664	11,888	11,776	50.2
Race of farmer	Total	5,148	1,965	398	132	2,661	1,064	1,142,670	3,871	198	1	1,935,327	254,521	1,680,806	13.2
	White	6,951	2,694	555	173	3,529	1,483	1,121,480	3,871	282	1	1,889,376	226,809	1,662,567	12.0
	Chinese	2,042	1,541	197	117	187	1,419	12,150	.....	675	.....	599	457	142	76.3
	Indians	1,100	319	18	38	725	112	5,075	.....	3	.....	43,342	26,782	16,560	61.8
	Negro	4,872	2,094	397	146	2,235	851	3,965	.....	248	.....	2,010	473	1,537	23.5
Race and tenure	WHITE.														
	Total	6,951	2,694	555	173	3,529	1,483	1,121,480	3,871	282	1	1,889,376	226,809	1,662,567	12.0
	Owners	4,838	1,888	467	157	2,326	997	566,750	3,871	190	1	375,213	134,510	240,703	35.8
	Part owners	12,878	6,614	673	268	5,323	3,697	108,630	.....	569	.....	103,097	34,130	68,967	33.1
	Owners and tenants	4,267	1,283	250	195	2,539	987	220	.....	37	.....	600	259	341	43.2
	Managers	26,799	8,151	1,616	314	16,718	5,692	384,880	.....	1,163	.....	1,353,974	27,461	1,326,513	2.0
	Cash tenants	4,562	2,449	313	133	1,667	730	39,270	.....	141	.....	32,855	18,586	14,267	56.6
	Share tenants	3,441	2,439	358	135	509	741	21,730	.....	117	.....	23,639	11,863	11,776	50.2
	COLORED.														
	Total	1,143	347	23	40	733	132	21,190	.....	12	.....	45,951	27,712	18,239	60.3
	Owners	1,127	334	20	39	734	119	8,580	.....	5	.....	44,131	26,774	17,357	60.7
	Owners and tenants	492	350	20	40	82	90	30	.....	8	.....	76	60	16	78.9
	Managers	6,634	845	505	132	5,152	728	1,300	.....	325	.....	880	179	701	20.3
	Cash tenants	1,735	1,327	176	98	134	1,076	11,280	.....	513	.....	839	674	165	80.3
	Share tenants	211	118	15	27	51	118	.....	.....	.....	.....	25	25	.....	100.0

	Total	5,148	1,965	390	132	2,661	1,064	1,142,670	3,871	198	1	1,935,327	254,521	1,680,806	13.2
Area of farm	Under 3 acres	2,918	140	85	46	2,647	760	166,780	200	213	.....	1,629	1,479	150	90.8
	3 to 9 acres	707	166	81	42	418	134	12,310	90	17	.....	4,738	4,056	682	85.6
	10 to 19 acres	1,296	429	176	58	633	257	16,790	200	33	.....	6,463	5,902	561	91.3
	20 to 49 acres	2,147	1,120	345	96	586	397	48,300	810	52	1	29,530	23,057	6,473	78.1
	50 to 99 acres	3,602	1,916	423	145	1,118	702	71,670	1,500	106	2	49,856	41,722	18,134	63.6
	100 to 174 acres	5,011	1,844	525	151	2,491	991	297,400	1,071	188	1	241,983	77,202	164,781	31.9
	175 to 259 acres	8,231	4,397	584	309	2,941	1,682	60,120	.....	420	.....	30,661	16,531	14,130	53.9
	260 to 499 acres	12,773	5,665	861	328	5,919	2,809	155,940	.....	582	.....	94,441	36,665	57,776	38.8
	500 to 999 acres	37,492	10,359	1,153	421	25,060	6,512	120,550	.....	1,076	.....	76,114	29,482	46,632	38.7
	1,000 acres and over	73,452	33,286	2,469	889	36,808	16,986	192,810	.....	2,716	.....	1,399,912	28,425	1,371,487	2.0
	Total	5,148	1,965	390	132	2,661	1,064	1,142,670	3,871	198	1	1,935,327	254,521	1,680,806	13.2
Principal source of revenue.	Hay and grain	2,518	1,727	267	130	394	644	297,400	1,851	101	1	182,667	104,671	77,996	57.3
	Vegetables	1,230	812	171	80	167	417	23,810	190	79	1	22,139	5,321	16,818	24.0
	Fruit	8,603	6,758	722	240	883	1,427	43,280	1,630	465	18	11,825	6,003	5,822	50.8
	Live stock	8,372	2,217	442	140	5,573	1,710	785,140	.....	340	.....	1,606,948	98,531	1,508,417	6.1
	Dairy	4,463	2,399	950	151	1,023	777	44,950	.....	95	.....	48,145	23,175	24,970	48.1
	Tobacco	760	500	.....	100	160	450	10	.....	10	.....	40	23	17	57.5
	Sugar	2,565	2,053	246	110	156	348	500	.....	112	.....	880	200	680	22.7
	Flowers and plants	940	630	300	10	.....	200	.....	.....	.....	.....	1	1	.....	100.0
	Nursery stock	12,357	9,250	2,625	175	307	1,850	500	.....	250	.....	64	64	.....	100.0
	Miscellaneous	3,291	1,248	205	95	1,743	408	37,020	200	69	.....	62,618	16,532	46,086	26.4
	Total	5,148	1,965	390	132	2,661	1,064	1,142,670	3,871	198	1	1,935,327	254,521	1,680,806	13.2
Value of products	$0	2,231	905	128	58	1,140	.....	14,890	.....	41	.....	38,449	7,709	30,740	20.0
	$1 to $49	628	275	46	44	263	25	8,930	.....	11	.....	24,727	9,519	15,208	38.5
	$50 to $99	787	426	68	41	252	71	4,690	.....	7	.....	24,058	11,181	12,877	46.5
	$100 to $249	1,823	864	235	80	644	162	29,120	370	30	.....	79,811	25,382	54,429	31.8
	$250 to $499	2,410	1,196	338	103	773	352	56,500	1,200	68	1	82,828	27,064	55,744	32.7
	$500 to $999	3,742	1,775	398	140	1,429	594	101,400	2,301	125	3	98,230	37,564	60,666	38.2
	$1,000 to $2,499	7,229	3,140	648	235	3,206	1,228	255,990	.....	327	.....	126,778	57,425	69,353	45.3
	$2,500 and over	30,326	9,301	1,533	420	18,992	8,243	671,150	.....	1,319	.....	1,460,446	78,657	1,381,789	5.4
	Total	5,148	1,965	390	132	2,661	1,064	1,142,670	3,871	198	1	1,935,327	254,521	1,680,806	13.2
Irrigation	Irrigated farms	4,891	2,283	433	156	2,019	878	730,357	3,871	173	1	558,821	230,774	328,047	41.3
	Unirrigated farms	5,825	1,127	278	68	4,352	1,553	412,313	.....	263	.....	1,376,506	23,747	1,352,759	1.7

TABLE 4.—*An exhibit by percentages of the relative numbers, values, expenditures, and areas, June 1, 1900, of farms operated by white and colored farmers, and farms of specified tenures, reported values of farm products not fed to live stock, principal sources of farm income, and areas.*

Items of farm wealth, etc.	Farms operated by—		Farms with specified tenures.						Farms with specified reported values of farm products.							
	White farmers.	Colored farmers.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Tenants on shares.	$0.	$1 to $49.	$50 to $99.	$100 to $249.	$250 to $449.	$500 to $999.	$1,000 to $2,499.	$2,500 and over.
Number of farms	69.0	31.0	82.3	3.3	0.2	5.8	5.2	3.2	6.2	14.2	11.5	17.0	14.3	14.5	13.5	8.6
Total value of farm property	93.1	6.9	55.4	8.2	.1	29.7	4.4	2.2	2.7	1.7	1.8	6.0	6.7	10.6	18.9	51.6
Value of farm and improvements	94.5	5.5	55.0	11.1	.1	23.7	6.2	3.9	2.9	2.0	2.5	7.5	8.7	13.1	21.5	41.8
Value of buildings	98.2	1.8	63.6	5.7	.1	23.7	4.0	2.9	2.0	1.7	2.0	10.3	12.4	14.8	22.4	34.4
Value of implements and machinery	90.5	9.5	71.1	6.7	.2	13.6	5.1	3.3	2.7	4.8	3.6	10.3	11.2	15.4	24.0	28.0
Value of live stock	91.4	8.6	53.8	6.6	.1	35.9	3.0	.6	2.7	1.4	1.1	4.1	4.2	7.8	16.2	62.5
Value of products	96.2	3.8	52.1	11.4	.1	30.5	3.7	2.2	.....	.3	.8	2.6	4.7	8.2	15.5	67.9
Amount expended for labor	98.1	1.9	50.4	9.5	.....	33.8	4.4	1.9	1.3	.8	.4	2.6	4.9	8.9	22.4	58.7
Amount expended for fertilizers	100.0	.....	100.0	.....	.....	.....	.....	.....	.....	.....	.....	9.6	31.0	59.4	.....	.....
Number of acres in farms	97.6	2.4	21.7	5.3	.....	70.0	1.8	1.2	2.0	1.3	1.2	4.1	4.3	5.1	6.5	75.5

Items of farm wealth, etc.	Farms with certain specified principal sources of income.										Farms of specified areas.									
	Hay and grain.	Vegetables.	Fruit.	Live stock.	Dairy products.	Tobacco.	Cotton.	Rice.	Sugar.	Miscellaneous.	Under 3 acres.	3 and under 10 acres.	10 and under 20 acres.	20 and under 50 acres.	50 and under 100 acres.	100 and under 175 acres.	175 and under 260 acres.	260 and under 500 acres.	500 and under 1,000 acres.	1,000 acres and over.
Number of farms	35.3	5.2	1.6	40.3	8.1	.....	.....	.....	0.1	9.4	14.0	12.4	8.7	15.9	11.6	27.2	2.5	4.6	1.9	1.2
Total value of farm property	17.3	1.3	2.7	65.6	7.0	.....	.....	.....	.1	6.0	8.0	1.7	2.2	6.7	8.3	26.4	4.0	11.3	11.7	19.7
Value of farm and improvements	31.0	2.1	5.6	45.5	9.7	.....	.....	.....	.1	6.0	1.0	1.0	1.9	9.1	11.3	25.5	5.5	13.3	10.7	20.7
Value of buildings	24.1	2.3	3.0	45.6	19.8	.....	.....	.....	.1	5.1	3.0	2.6	3.9	14.0	12.6	36.6	3.7	10.2	5.7	7.7
Value of implements and machinery	35.0	3.1	2.9	42.9	9.3	.....	.....	.....	.1	6.7	5.0	3.9	3.8	11.6	12.8	31.2	5.8	11.5	6.2	8.2
Value of live stock	5.2	.5	.5	84.4	3.1	.....	.....	.....	.....	6.3	13.9	1.9	2.0	3.7	5.2	25.3	2.9	10.1	13.7	21.3
Value of products	21.4	2.0	2.2	64.8	5.9	.....	.....	.....	.1	3.6	10.0	1.6	2.2	5.9	7.7	25.2	3.9	12.2	11.8	19.5
Amount expended for labor	18.2	2.1	3.8	68.7	3.9	.....	.....	.....	.....	3.3	14.6	1.1	1.5	4.2	6.3	26.0	5.3	13.6	10.5	16.9
Amount expended for fertilizers	47.8	5.0	42.1	.....	.....	.....	.....	.....	.....	5.1	5.2	2.3	5.2	20.9	38.8	27.6	.....	.....	.....	.....
Number of acres in farms	9.4	1.2	.6	83.0	2.5	.....	.....	.....	.1	3.2	.1	.3	.3	1.5	2.6	12.5	1.6	4.9	3.9	72.3

TABLE 5.—*All farms, and farms of specified tenures, June 1, 1900, classified by color of farmers, area, principal source of income, and value of products of 1899 not fed to live stock.*

Tenure.	Total number of farms.	Number of farmers.		Farms, classified by area.										
		White.	Colored.	Under 3 acres.	3 and under 10 acres.	10 and under 20 acres.	20 and under 50 acres.	50 and under 100 acres.	100 and under 175 acres.	175 and under 260 acres.	260 and under 500 acres.	500 and under 1,000 acres.	1,000 acres and over.	Average size in acres.
The Territory	5,809	4,006	1,803	814	718	506	922	674	1,581	143	268	112	71	333.2
Owners	4,784	3,015	1,769	721	685	431	775	536	1,307	91	174	43	21	87.7
Part owners	191	191	.....	2	2	6	20	29	29	29	33	26	15	539.8
Owners and tenants	10	6	4	.....	2	1	2	3	2	.....	.....	.....	.....	67.6
Managers	335	331	4	75	6	9	19	21	100	7	37	29	32	4,044.3
Cash tenants	300	278	22	14	14	33	67	56	79	11	16	9	1	112.3
Share tenants	189	185	4	2	9	26	39	29	64	5	8	5	2	125.2

Tenure.	Farms, classified by principal source of income.										Farms, classified by value of product of 1899 not fed to live stock.							
	Hay and grain.	Vegetables.	Fruit.	Live stock.	Dairy.	Tobacco.	Cotton.	Rice.	Sugar.	Miscellaneous.	$0.	$1 to $49.	$50 to $99.	$100 to $249.	$250 to $499.	$500 to $999.	$1,000 to $2,499.	Over $2,500.
The Territory	2,052	302	93	2,343	472	1	.....	.....	5	541	360	825	669	986	833	844	783	509
Owners	1,721	263	69	1,880	378	1	.....	.....	5	467	297	798	626	852	675	668	592	276
Part owners	68	5	2	82	24	.....	.....	.....	.....	10	4	.....	1	17	27	32	54	56
Owners and tenants	6	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	2	3	.....	4	.....	1
Managers	36	4	12	249	12	.....	.....	.....	.....	22	37	10	9	23	25	38	51	142
Cash tenants	115	18	7	95	41	.....	.....	.....	.....	24	13	11	20	52	63	66	55	20
Share tenants	106	12	3	33	17	.....	.....	.....	.....	18	9	6	11	39	43	36	31	14

TABLE 6.—*All farms, and farms of specified reported values of products not fed to live stock, June 1, 1900, classified by color of farmers, area, tenure, and principal source of income.*

Reported value of products.	Total number of farms.	Number of farmers.		Farms, classified by area.										
		White.	Colored.	Under 3 acres.	3 and under 10 acres.	10 and under 20 acres.	20 and under 50 acres.	50 and under 100 acres.	100 and under 175 acres.	175 and under 260 acres.	260 and under 500 acres.	500 and under 1,000 acres.	1,000 acres and over.	Average size in acres.
The Territory	5,809	4,006	1,803	814	718	506	922	674	1,581	143	268	112	71	333.2
$0	360	253	107	135	20	11	24	23	119	5	13	7	3	106.8
$1 to $99	825	165	660	286	238	69	80	51	96	2	2	1	.....	30.0
$100 to $99	669	179	490	73	236	126	99	50	76	1	8	.....	.....	36.0
$100 to $249	966	606	360	58	156	165	226	101	236	15	20	5	4	80.9
$250 to $499	838	725	108	33	35	84	219	108	296	21	28	7	2	99.4
$500 to $999	844	805	39	31	19	27	185	170	285	23	33	16	5	116.4
$1,000 to $2,499	783	773	10	32	7	15	70	137	328	47	80	12	5	161.9
$2,500 and over	509	500	9	66	7	9	19	34	145	29	84	64	52	2,869.2

Reported value of products.	Farms, classified by tenure.						Farms, classified by principal source of income.									
	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.	Hay and grain.	Vegetables.	Fruit.	Live stock.	Dairy.	Tobacco.	Cotton.	Rice.	Sugar.	Miscellaneous.
The Territory	4,784	191	10	335	300	189	2,052	302	93	2,343	472	1	.....	.....	5	541
$0	297	4	.....	37	13	9	26	.....	1	143	2	.....	.....	.....	.....	188
$1 to $99	798	.....	.....	10	11	6	429	67	5	252	23	.....	.....	.....	.....	79
$100 to $99	626	1	2	9	20	11	293	84	4	209	41	.....	.....	.....	1	37
$100 to $249	852	17	3	23	52	39	329	67	12	389	125	.....	.....	.....	.....	64
$250 to $499	675	27	.....	25	63	43	282	28	18	305	111	1	.....	.....	2	86
$500 to $999	668	32	4	38	66	36	338	24	22	340	68	.....	.....	.....	2	50
$1,000 to $2,499	592	54	.....	51	55	31	277	23	13	375	66	.....	.....	.....	.....	29
$2,500 and over	276	56	1	142	20	14	78	9	18	360	36	.....	.....	.....	.....	8

TABLE 7.—*Farms, June 1, 1900, classified by area, tenure, and by color of farmers, by counties and Indian reservations, and also for groups of irrigated and unirrigated areas.*

A.—BY COUNTIES AND INDIAN RESERVATIONS.

Counties and Indian reservations.	All farms, by area.											
	Total number of farms.	Under 3 acres.	3 and under 10 acres.	10 and under 20 acres.	20 and under 50 acres.	50 and under 100 acres.	100 and under 175 acres.	175 and under 260 acres.	260 and under 500 acres.	500 and under 1,000 acres.	1,000 acres and over.	Average size in acres.
The Territory	5,809	814	718	506	922	674	1,581	143	268	112	71	333.2
Apache	280	42	14	15	53	40	90	9	10	6	1	108.3
Cochise	252	24	1	6	14	22	125	11	29	10	10	250.0
Coconino	280	71	4	4	11	9	135	8	19	12	7	514.1
Gila	237	61	3	13	34	21	95	3	5	1	1	126.6
Graham	509	26	13	48	141	105	126	18	19	3	10	339.0
Maricopa	1,089	20	40	84	275	203	280	53	77	42	15	156.8
Mohave	99	32	7	6	12	16	22	2	2	.....	.....	59.1
Navajo	138	9	10	23	48	10	28	.....	6	1	3	7,370.0
Pima	252	13	8	21	32	28	120	3	15	6	6	282.4
Pinal	237	20	9	7	23	28	106	7	19	12	6	193.1
Santa Cruz	113	7	.....	3	6	5	72	2	10	3	5	445.0
Yavapai	422	66	1	11	29	55	184	21	45	4	6	160.5
Yuma	133	11	4	.....	7	10	79	2	10	10	.....	178.2
Colorado River[1]	52	41	9	1	1	.....	.....	.....	.....	.....	.....	2.6
Fort Apache[1]	395	208	153	29	4	.....	.....	.....	.....	1	.....	5.2
Gila River and Salt River[1]	653	1	112	159	213	119	45	3	1	.....	.....	36.7
Gila Bend[1]	15	.....	2	10	3	.....	.....	.....	.....	.....	.....	12.3
Moqui[1]	450	63	313	59	13	.....	2	.....	.....	.....	.....	7.0
Navaho[1,2]	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	598.0
Papago[1,3]	194	99	11	7	2	3	71	1	.....	.....	.....	54.4
San Carlos[1,2]	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2,000.0
Supai and Walapai[1]	7	.....	4	.....	1	.....	1	.....	1	.....	.....	69.0

B.—BY IRRIGATION.

Irrigated farms	4,210	269	414	428	869	626	1,159	122	197	81	45	132.7
Unirrigated farms	1,599	514	304	78	53	48	422	21	71	31	26	877.9

[1] Indian reservation.

[2] One report for tribe; not an individual farm.

[3] Including nomadic Papago.

TABLE 7—*Farms, June 1, 1900, classified by area, tenure, and by color of farmers, by counties and Indinn reservations, etc.*—Continued.

A.—BY COUNTIES AND INDIAN RESERVATIONS—Continued.

Counties and Indian reservations.	All farms, by tenure.						Farms of white farmers, by tenure.						
	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.	Total.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.
The Territory	4,784	191	10	335	300	189	4,006	3,015	191	6	331	278	185
Apache	224	11	1	16	15	13	280	224	11	1	16	15	13
Cochise	173	13	.....	43	19	4	249	172	13	.....	43	17	4
Coconino	238	17	.....	18	4	3	280	238	17	.....	18	4	3
Gila	205	1	.....	25	2	4	237	205	1	.....	25	2	4
Graham	396	14	2	27	13	57	505	395	14	2	26	11	57
Maricopa	763	114	1	58	132	21	1,086	761	114	1	58	131	21
Mohave	89	.....	2	7	1	.....	92	82	.....	2	7	1	.....
Navajo	109	2	.....	3	.....	24	138	109	2	.....	3	.....	24
Pima	132	2	.....	45	50	23	236	125	2	.....	44	42	23
Pinal	167	8	.....	32	27	3	230	163	8	.....	31	25	3
Santa Cruz	91	1	.....	11	4	6	112	91	1	.....	11	3	6
Yavapai	339	6	.....	42	12	23	418	337	6	.....	41	11	23
Yuma	108	2	.....	6	14	3	132	108	2	.....	6	13	3
Colorado River [1]	51	.....	.....	1	.....	.....	1	.....	.....	.....	1	.....	.....
Fort Apache [1]	395	.....	.....	.....	.....	.....	3	3	.....	.....	.....	.....	.....
Gila River and Salt River [1]	645	.....	2	.....	3	3	.....	.....	.....	.....	.....	.....	.....
Gila Bend [1]	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Moqui [1]	443	.....	2	1	3	1	5	1	.....	.....	1	3	.....
Navaho [1,2]	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Papago [1,3]	192	.....	.....	.....	1	1	2	1	.....	.....	.....	.....	1
San Carlos [1,2]	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Supai and Walapai [1]	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

B.—BY IRRIGATION—Continued.

Irrigated farms	3,461	172	7	151	256	163	2,949	2,928	171	5	150	235	160
Unirrigated farms	1,323	19	3	184	44	26	1,026	756	20	1	181	43	25

[1] Indian reservation.

[2] One report for tribe: not an individual farm.

[3] Including nomadic Papago.

A.—BY COUNTIES AND INDIAN RESERVATIONS—Continued.

Counties and Indian reservations.	Farms of colored farmers, by tenure.							Percentage of farms of—							
	Total.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.	White farmers.	Colored farmers.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.
The Territory	[1]1,803	1,769	.....	4	4	22	4	69.0	31.0	82.3	3.3	0.2	5.8	5.2	3.2
Apache	.....	.....	.....	.....	.....	.....	.....	100.0	.....	80.0	3.9	.4	5.7	5.4	4.6
Cochise	3	1	.....	.....	.....	2	.....	98.8	1.2	68.6	5.2	.....	17.1	7.5	1.6
Coconino	.....	.....	.....	.....	.....	.....	.....	100.0	.....	85.0	6.1	.....	6.4	1.4	1.1
Gila	.....	.....	.....	.....	.....	.....	.....	100.0	.....	86.5	.4	.....	10.6	.8	1.7
Graham	4	1	.....	.....	1	2	.....	89.2	.8	77.8	2.8	.4	5.3	2.5	11.2
Maricopa	3	2	.....	.....	.....	1	.....	99.7	.3	70.1	10.5	.1	3.3	12.1	1.9
Mohave	7	7	.....	.....	.....	.....	.....	92.9	7.1	89.9	.....	2.0	7.1	1.0	.....
Navajo	.....	.....	.....	.....	.....	.....	.....	100.0	.....	79.0	1.4	.....	2.2	.....	17.4
Pima	16	7	.....	.....	1	8	.....	93.7	6.3	52.4	.8	.....	17.9	19.8	9.1
Pinal	7	4	.....	.....	1	2	.....	97.0	3.0	70.4	3.4	.....	13.5	11.4	1.3
Santa Cruz	1	.....	.....	.....	.....	1	.....	99.1	.9	80.5	.9	.....	9.7	3.6	5.3
Yavapai	4	2	.....	.....	1	1	.....	99.0	1.0	80.3	1.4	.....	10.0	2.8	5.5
Yuma	1	.....	.....	.....	.....	1	.....	99.2	.8	81.2	1.5	.....	4.5	10.5	2.3
Colorado River [2]	51	51	.....	.....	.....	.....	.....	1.9	98.1	98.1	.....	.....	1.9	.....	.....
Fort Apache [2]	392	392	.....	.....	.....	.....	.....	.8	99.2	100.0	.....	.....	.....	.....	.....
Gila River and Salt River [2]	653	645	.....	2	.....	3	3	.....	100.0	98.8	.....	.3	.....	.4	.5
Gila Bend [2]	15	15	.....	.....	.....	.....	.....	.....	100.0	100.0	.....	.....	.....	.....	.....
Moqui [2]	445	442	.....	2	.....	.....	1	1.1	98.9	98.4	.....	.5	.2	.7	.2
Navaho [2, 3]	1	1	.....	.....	.....	.....	.....	.....	100.0	100.0	.....	.....	.....	.....	.....
Papago [2, 4]	192	191	.....	.....	.....	1	.....	1.0	99.0	99.0	.....	.....	.....	.5	.5
San Carlos [2, 3]	1	1	.....	.....	.....	.....	.....	.....	100.0	100.0	.....	.....	.....	.....	.....
Supai and Walapai [2]	7	7	.....	.....	.....	.....	.....	.....	100.0	100.0	.....	.....	.....	.....	.....

B.—BY IRRIGATION—Continued.

Irrigated farms	1,261	1,235	.....	2	1	20	3	70.0	30.0	82.2	4.1	.1	3.6	6.1	3.9
Unirrigated farms	542	534	.....	2	3	2	1	65.4	34.6	82.4	1.2	.2	11.7	2.8	1.7

[1] Comprising 1,769 Indians, 18 Chinese, and 16 negroes. [2] Indian reservation. [3] One report for tribe; not an individual farm. [4] Including nomadic Papago.

TABLE 8.—*Number and value of domestic animals on farms and ranges, June 1, 1900, by counties and Indian reservations.*

Counties and Indian reservations.	Total number of farms.	All domestic animals.		Neat cattle.									
		Number of farms reporting.	Value.	Number of farms reporting.	Calves under 1 year.		Steers 1 and under 2 years.		Steers 2 and under 3 years.		Steers 3 years and over.		Bulls 1 year and over.	
					Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
The Territory	5,809	5,596	$15,311,316	3,766	135,181	$1,133,178	65,203	$898,604	42,116	$743,845	30,577	$666,953	20,437	$483,411
Apache	280	271	1,024,190	212	3,546	30,729	2,411	35,661	834	21,853	734	20,790	613	20,147
Cochise	252	251	2,821,775	212	29,435	269,563	11,098	154,171	9,146	128,532	5,488	113,961	4,816	93,553
Coconino	280	247	777,473	127	2,730	15,622	1,703	24,976	926	16,789	730	16,404	560	12,587
Gila	237	235	1,036,446	192	11,742	94,611	5,003	74,214	3,066	56,555	2,447	51,221	2,429	52,074
Graham	509	494	1,577,172	416	16,282	157,136	6,095	88,996	3,030	57,550	2,489	63,376	2,190	67,205
Maricopa	1,089	1,047	1,847,929	935	15,182	132,859	7,539	128,136	6,099	141,192	4,546	116,010	1,582	39,740
Mohave	99	92	438,592	82	3,902	26,050	2,530	37,019	1,941	35,330	2,174	44,971	731	14,036
Navajo	138	137	288,721	157	676	4,160	818	12,110	360	6,202	163	3,853	257	7,615
Pima	252	241	1,472,125	178	17,463	145,889	11,690	126,213	7,295	117,372	5,467	105,603	2,161	52,020
Pinal	237	222	671,424	175	8,617	64,839	3,654	50,644	2,018	36,670	834	17,803	1,050	33,908
Santa Cruz	113	106	790,429	86	8,340	71,522	3,451	47,408	1,941	32,734	1,142	23,999	1,259	52,296
Yavapai	422	414	1,286,422	353	12,694	92,073	7,190	93,548	4,706	80,649	3,452	68,529	2,317	37,686
Yuma	133	127	105,019	84	498	4,257	492	7,590	165	3,322	124	2,621	89	2,425
Colorado River [1]	52	49	11,907	5	24	153	28	282	20	375	184	5,145	11	335
Fort Apache [1]	395	389	66,722	66	216	1,143	20	270	75	1,535	14	335	42	917
Gila Bend [1]	15	15	1,964	4	6	42								
Gila River and Salt River [1]	653	633	129,198	294	1,105	5,567	173	2,107	107	1,833	144	2,880	121	1,907
Moqui [1]	450	430	190,357	74	223	1,126	83	830	84	1,251	144	2,787	38	630
Navaho [1 2]	1	1	629,851	1	1,679	11,270	839	10,794	105	1,008	172	3,440	89	2,895
Papago [1 3]	194	193	84,674	111	670	3,817	226	2,649	97	1,503	2	40	57	635
San Carlos [1 2]	1	1	54,090	1	150	750	100	1,000	100	1,500	125	3,125	25	800
Supai and Walapai [1]	7	1	4,836	1							2	60		

Counties and Indian reservations.	Neat cattle—continued.						Horses.						
	Heifers 1 and under 2 years.		Dairy cows 2 years and over.		Other cows 2 years and over.		Number of farms reporting.	Colts under 1 year.		Colts 1 and under 2 years.		Horses 2 years and over.	
	Number.	Value.	Number.	Value.	Number.	Value.		Number.	Value.	Number.	Value.	Number.	Value.
The Territory	73,437	$961,818	17,965	$577,693	357,719	$5,901,964	5,281	18,976	$82,610	22,283	$152,878	83,804	$1,466,417
Apache	2,387	32,841	942	22,779	10,861	205,940	259	712	3,157	808	6,725	4,022	79,123
Cochise	15,971	216,475	1,396	39,852	95,825	1,584,455	272	1,037	5,073	1,252	21,479	7,108	154,245
Coconino	1,753	20,608	258	8,390	4,643	76,970	215	779	3,582	1,271	10,250	4,975	82,924
Gila	6,654	89,677	1,012	23,190	29,025	460,125	227	719	7,889	384	5,032	3,516	76,284
Graham	9,558	131,085	1,436	44,720	45,298	797,155	465	409	4,212	411	6,732	4,024	129,108
Maricopa	6,912	101.787	6,869	288,380	26,815	560,617	1,019	666	10,929	681	17,487	4,250	174,115
Mohave	1,993	23,108	900	19,427	12,160	180,203	90	213	1,701	251	3,352	2,013	39,954
Navajo	1,008	11,454	458	12,924	1,969	28,565	127	143	1,106	291	2,566	1,506	31,565
Pima	9,425	110,529	1,830	33,635	44,388	659,780	221	1,396	4,797	1,504	10,446	6,259	75,689
Pinal	4,112	46,499	543	15,321	22,129	325,795	217	406	2,450	452	4,779	2,379	49,190
Santa Cruz	4,523	66,657	442	8,145	22,821	396,224	102	605	3,758	734	8,735	3,511	60,119
Yavapai	7,394	89,072	1,504	47,954	32,982	453,127	382	953	4,570	1,388	11,660	7,503	120,463
Yuma	215	33,269	313	11,085	691	13,841	127	142	1,730	131	2,550	799	30,378
Colorado River [1]	17	190	15	320	68	1,305	48	22	136	9	60	163	2,936
Fort Apache [1]	.....	.....	13	425	554	10,790	385	1,286	3,449	498	3,073	3,581	42,186
Gila Bend [1]	.....	.....	.....	.....	12	180	15	5	10	6	13	142	1,406
Gila River and Salt River [1]	210	2,416	31	1,056	2,282	42,542	622	553	2,709	462	4,275	4,487	59,378
Moqui [1]	131	1,441	3	90	725	12,760	294	362	963	486	2,166	3,705	21,457
Navaho [1 2]	798	10,160	.....	.....	2,746	59,840	1	7,752	16,881	9,752	23,582	13,780	162,832
Papago [1 3]	126	2,050	.....	.....	1,463	26,510	191	816	3,508	662	5,716	3,323	32,721
San Carlos [1 2]	250	2,500	.....	.....	262	5,240	1	.....	.....	800	1,800	2,416	36,240
Supai and Walapai [1]	.....	.....	.....	.....	.....	.....	1	.....	.....	50	400	342	4,104

[1] Indian reservation.

[2] One report for tribe; not an individual farm.

[3] Including nomadic Papago.

TABLE 8.—*Number and value of domestic animals on farms and ranges, June 1, 1900, by counties and Indian reservations*—Continued.

Counties and Indian reservations.	Mules.							Asses.			Sheep.		
	Number of farms reporting.	Colts under 1 year.		Colts 1 and under 2 years.		Mules 2 years and over.		Number of farms reporting.	Number.	Value.	Number of farms reporting.	Lambs under 1 year.	
		Number.	Value.	Number.	Value.	Number.	Value.					Number.	Value.
The Territory	890	445	$7,273	552	$13,384	3,080	$102,882	883	4,625	$32,162	606	193,303	$284,858
Apache	35	15	270	14	455	65	2,479	58	425	2,581	64	75,916	109,247
Cochise	31	16	75	17	720	171	5,579	21	79	521	6	3,400	5,100
Coconino	40	1	75	8	65	141	4,500	37	261	2,233	53	47,936	81,066
Gila	55	2	25	8	270	113	3,715	49	358	1,783	8	14	28
Graham	55			38	1,220	96	4,200	13	32	183	15	1,007	1,056
Maricopa	169	104	2,832	76	2,740	371	24,946	40	200	3,349	105	6,966	13,760
Mohave	22	2	15	8	248	41	1,190	11	101	1,005	2	40	80
Navajo	13	6	150	6	210	21	920	16	108	827	19	20,504	35,364
Pima	57	31	200	56	515	240	6,894	31	307	1,987	4	1,300	1,950
Pinal	35	7	50	2	30	119	3,714	25	82	649	6	1,573	3,510
Santa Cruz	24	56	1,590	61	3,020	111	6,305	17	56	4,363	1		
Yavapai	83	20	428	62	1,299	261	9,389	35	504	2,822	15	11,720	15,515
Yuma	23	3	55	9	400	83	5,580	23	42	325	5		
Colorado River [1]	10					19	565	8	23	125			
Fort Apache [1]	35	2	10	1	20	76	1,285	92	330	1,248			
Gila Bend [1]	5					9	205	7	22	108			
Gila River and Salt River [1]	40	2	17	16	390	48	1,010	21	38	159	2	2	2
Moqui [1]	83	20	147	53	727	151	2,221	302	801	4,202	300	12,478	10,667
Navajo [1 2]	1	89	329	67	295	736	14,244	1	532	2,466	1	10,447	7,513
Papago [1 3]	72	69	1,005	50	760	157	2,921	74	252	839			
San Carlos [1 2]	1					41	820	1	63	315			
Supai and Walapai [1 2]	1					10	200	1	9	72			

Counties and Indian reservations.	Sheep—continued.				Swine.			Goats.			Received in 1899 from sale of live animals.		Value of animals slaughtered on farms.	
	Ewes 1 year and over.		Rams and wethers 1 year and over.		Number of farms reporting.	Number.	Value.	Number of farms reporting.	Number.	Value.	Number of farms reporting.	Amount.	Number of farms reporting.	Value.
	Number.	Value.	Number.	Value.										
The Territory	452,271	$1,061,358	216,187	$491,578	1,063	18,103	$80,587	436	98,403	$167,863	1,977	$2,908,745	1,687	$296,013
Apache	119,445	336,099	36,160	88,254	133	510	1,788	26	1,874	3,272	126	129,298	189	22,600
Cochise	5,718	16,943	2,481	7,960	38	434	1,968	4	480	1,550	163	426,134	133	37,197
Coconino	91,034	248,973	42,769	144,501	40	713	3,432	27	1,754	3,526	83	147,143	86	48,370
Gila	35	101	8	28	78	1,204	3,943	21	12,152	35,681	166	156,328	156	16,192
Graham	2,706	6,064	816	2,661	189	1,057	4,067	13	3,610	10,446	190	316,285	279	35,652
Maricopa	8,924	26,623	5,293	17,385	244	9,628	44,310	23	288	732	431	503,065	162	24,476
Mohave	68	204	40	120	20	240	758	4	4,607	9,821	52	50,200	47	13,518
Navajo	31,498	89,233	12,471	36,497	91	404	2,407	11	426	993	77	273,836	108	10,832
Pima	4,937	12,524	840	2,000	29	783	3,331	8	276	751	113	365,033	100	13,909
Pinal	4,300	16,650	1,520	6,000	58	624	2,658	8	133	265	114	119,793	94	15,102
Santa Cruz	46	117	31	114	27	745	3,240	2	41	83	48	122,550	43	10,086
Yavapai	32,428	91,532	11,749	38,573	52	464	2,526	27	10,749	25,007	148	283,733	116	33,971
Yuma	2,500	10,000	58	401	24	1,126	5,184	1	4	6	6	1,338	7	895
Colorado River[1]											9	576	1	4,500
Fort Apache[1]					1	9	30						24	3,460
Gila Bend[1]														
Gila River and Salt River[1]	1	2			39	162	945	2	2	3	139	6,654	45	2,338
Moqui[1]	29,580	55,916	21,122	41,533				258	17,236	29,443	39	2,387	70	2,247
Navajo[1 2]	119,051	150,377	80,829	105,551				1	44,771	46,284				
Papago[1 3]											73	4,392	27	668

[1] Indian reservation.

[2] One report for tribe; not an individual farm.

[3] Including nomadic Papago.

TABLE 9.—*Domestic animals, poultry, and bees on farms of specified classes, June 1, 1900.*

Basis of classification.	Class of farm.	No. of farms.	All domestic animals.		All neat cattle.		Dairy cows.		Other cows.		No of all other neat cattle.	Horses.		Mules.	
			No. of farms reporting.	Value.	No. of farms reporting.	Number.	No. of farms reporting.	Number.	No. of farms reporting.	Number.		No. of farms reporting.	Number.	No. of farms reporting.	Number.
	Total	5,809	5,596	$15,311,316	3,766	742,635	2,493	17,965	2,004	357,719	366,951	5,281	125,063	890	4,077
Tenure	Owners	4,784	4,618	8,205,432	5,004	348,279	1,943	12,832	1,624	160,284	175,163	4,369	99,647	607	3,211
	Part owners	191	191	1,002,100	176	29,616	158	2,031	65	10,240	17,345	184	3,274	45	207
	Owners and tenants	10	10	15,240	4	813	5	337	1	50	426	11	166	.....	.....
	Managers	335	316	5,548,990	269	338,031	117	1,137	225	177,685	159,209	202	17,954	80	429
	Cash tenants	300	285	451,335	194	23,323	168	1,133	52	8,643	13,547	260	2,895	44	170
	Share tenants	189	176	88,219	119	2,573	102	495	37	817	1,261	165	1,127	24	60
Race of farmer	Total	5,809	5,596	15,311,316	3,766	742,635	2,493	17,965	2,004	357,719	366,951	5,281	125,063	890	4,077
	Whites	4,006	3,836	13,992,258	3,180	722,193	2,442	17,781	1,462	348,090	356,352	3,670	69,593	640	2,366
	Chinese	18	17	3,195	.....	.....	.....	.....	.....	.....	.....	17	75	1	2
	Indians	1,769	1,728	1,280,312	574	18,460	45	173	534	8,627	9,660	1,579	55,193	244	1,690
	Negroes	16	15	35,551	12	1,982	6	11	8	1,032	939	15	202	5	19
Area of farm	Total	5,809	5,596	15,311,316	3,766	742,635	2,493	17,965	2,004	357,719	366,951	5,281	125,063	890	4,077
	Under 3 acres	814	791	2,151,016	502	105,036	127	1,712	373	50,269	53,055	757	17,611	192	676
	3 to 9 acres	718	677	285,037	218	8,056	73	307	118	4,036	3,713	544	5,690	83	196
	10 to 19 acres	506	477	299,979	328	12,212	171	437	119	5,819	5,956	450	4,018	36	82
	20 to 49 acres	922	899	541,983	757	19,714	523	2,105	212	8,081	9,528	871	6,242	70	177
	50 to 99 acres	674	650	783,729	581	29,429	398	2,502	181	10,664	16,203	636	7,465	78	189
	100 to 174 acres	1,581	1,522	3,881,362	778	203,507	815	7,264	672	96,392	99,851	1,460	23,595	252	864
	175 to 259 acres	143	141	433,248	146	16,177	104	915	70	7,498	7,764	137	5,119	38	145
	260 to 499 acres	268	261	1,545,660	260	84,760	171	1,433	133	42,252	41,075	254	7,579	73	236
	500 to 999 acres	112	107	2,104,887	126	79,350	68	512	72	36,539	42,299	107	35,116	30	1,093
	1,000 acres and over	71	71	3,284,415	70	184,394	43	718	54	96,169	87,507	65	123,628	38	419
Principal source of income	Total	5,809	5,596	15,311,316	3,766	742,635	2,493	17,965	2,004	357,719	366,951	5,281	125,063	890	4,077
	Hay and grain	2,052	1,944	769,302	1,158	20,319	750	2,617	384	5,612	11,932	1,847	14,897	206	654
	Vegetables	302	281	56,705	102	1,369	69	121	34	277	951	241	1,176	26	40
	Fruit	93	85	77,067	79	3,255	59	137	15	1,065	2,015	81	588	10	29
	Live stock	2,343	2,208	12,971,126	1,696	680,356	1,008	8,827	1,305	338,243	333,339	2,202	68,877	534	2,115
	Dairy products	472	472	469,346	447	16,030	444	5,370	113	2,703	7,982	445	3,369	56	179
	Tobacco	1	1	1,234	1	116	1	90	.....	.....	31	2	24	.....	.....
	Sugar	5	5	841	3	6	2	2	.....	.....	4	6	25	1	2
	Miscellaneous	541	510	965,695	280	21,184	160	801	153	9,789	10,697	457	36,107	57	1,068
Farm or range	Animals on ranges	3,836	3,748	14,483,506	2,490	726,595	1,004	12,002	1,644	355,661	358,980	2,777	111,291	624	3,359
	Animals on farms	1,973	1,848	827,810	1,276	16,040	1,489	5,963	360	2,058	7,971	2,504	13,772	266	718

Basis of classification.	Class of farm.	Asses and burros.		Sheep.			Swine.		Goats.		Poultry.		Bees.	
		No. of farms reporting.	Number.	No. of farms reporting.	No. of lambs.	No. of sheep 1 year and over.	No. of farms reporting.	Number.	No. of farms reporting.	Number.	No. of farms reporting.	Value.	No. of farms reporting.	Value.
	Total	883	4,625	602	193,303	668,458	1,063	18,103	436	98,403	3,304	$80,798	489	$66,603
Tenure	Owners	806	3,922	524	147,976	544,805	822	9,160	401	90,502	2,718	58,276	383	47,420
	Part owners	13	110	25	16,654	52,475	66	5,440	5	76	162	7,854	32	6,772
	Owners and tenants	3	10	6	14	331	4	28	3	19	8	165	3	158
	Managers	36	512	22	25,649	65,894	54	2,333	16	7,586	118	3,710	19	1,691
	Cash tenants	16	41	18	104	2,852	55	764	7	163	179	7,282	37	7,963
	Share tenants	9	30	7	2,906	2,101	62	378	4	57	119	3,531	15	2,599
	Total	883	4,625	602	193,303	668,458	1,063	18,103	436	98,403	3,304	80,798	489	66,603
Race of farmer	Whites	371	2,483	298	159,088	385,578	1,019	17,880	174	37,179	2,659	77,468	485	66,574
	Chinese	.....	.....	.....	.....	.....	2	40	.....	.....	6	167	1	12
	Indians	511	2,138	304	34,265	282,880	40	169	262	61,224	633	2,971	2	5
	Negroes	1	4	.....	.....	.....	2	14	.....	.....	6	192	1	12
	Total	883	4,625	602	193,303	668,458	1,063	18,103	436	98,403	3,304	80,798	489	66,603
Area of farm	Under 3 acres	225	1,341	120	56,826	125,114	41	519	110	26,190	147	1,104	15	2,391
	3 to 9 acres	264	981	201	8,688	29,128	25	120	168	10,907	227	2,621	16	2,733
	10 to 19 acres	84	385	64	7,648	12,521	70	344	56	3,126	277	5,806	30	7,205
	20 to 49 acres	47	168	55	6,129	19,177	231	913	24	6,251	712	13,927	94	22,224
	50 to 99 acres	30	93	37	9,187	14,117	180	1,382	12	505	503	10,952	76	9,367
	100 to 174 acres	154	223	73	43,973	121,097	356	4,633	49	6,258	1,043	24,611	184	11,489
	175 to 259 acres	14	123	11	6,838	27,626	32	931	5	119	107	3,161	23	3,629
	260 to 499 acres	30	165	16	11,232	34,524	70	3,797	6	148	186	7,113	33	4,252
	500 to 999 acres	19	820	13	29,990	247,874	34	3,894	3	44,831	65	10,034	11	2,885
	1,000 acres and over	16	326	12	12,792	37,280	24	1,540	3	68	37	1,469	7	428
	Total	883	4,625	602	193,303	668,458	1,063	18,103	436	98,403	3,304	80,798	489	66,603
Principal source of income	Hay and grain	237	661	110	1,658	5,619	376	4,853	76	3,340	1,072	22,712	128	11,087
	Vegetables	72	170	23	84	305	23	177	21	105	138	1,979	20	508
	Fruit	4	12	3	25	10	13	65	1	90	60	2,319	15	696
	Live stock	483	2,702	397	177,127	442,684	411	10,797	298	48,541	1,335	39,720	223	47,041
	Dairy products	28	179	31	226	163	154	1,382	13	330	396	9,467	65	5,552
	Tobacco	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	15	.....	.....
	Sugar	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	70	.....	.....
	Miscellaneous	59	901	38	14,183	219,677	86	789	27	45,997	300	4,516	38	1,719
Farm or range	Animals on ranges	696	4,191	527	193,077	668,170	456	12,719	386	96,756	231	6,147	27	2,694
	Animals on farms	187	434	75	226	288	607	5,384	50	1,647	3,073	74,651	562	63,909

TABLE 10.—*Number of domestic animals in barns and inclosures, not on farms or ranges, June 1, 1900, by counties and Indian reservations.*

Counties and Indian reservations.	Number of inclosures reporting domestic animals.	Neat cattle.								
		All neat cattle.	Calves under 1 year.	Steers 1 and under 2 years.	Steers 2 and under 3 years.	Steers 3 years and over.	Bulls 1 year and over.	Heifers 1 and under 2 years.	Dairy cows 2 years and over.	Other cows 2 years and over.
The Territory	2,072	2,238	322	101	64	49	14	127	673	888
Apache	81	185	49	10	1	.....	1	17	87	20
Cochise	172	79	15	5	.....	2	.....	8	49	.....
Coconino	101	76	9	2	.....	.....	.....	2	63	.....
Gila	137	64	16	.....	.....	.....	.....	1	40	7
Graham	352	1,268	136	72	28	4	12	72	148	796
Maricopa	419	113	17	1	1	1	.....	7	86	.....
Mohave	4	.....	.....	.....	.....	.....	.....	.....	.....	.....
Navajo	43	42	16	.....	.....	.....	.....	2	24	.....
Pima	266	85	11	1	.....	10	.....	8	55	.....
Pinal	112	83	19	9	24	.....	.....	4	27	.....
Santa Cruz	124	132	17	1	10	1	1	2	38	62
Yavapai	199	94	14	.....	.....	31	.....	1	48	.....
Yuma	30	12	1	.....	.....	.....	.....	3	8	.....
Moqui[1]	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Navaho[1]	29	5	2	.....	.....	.....	.....	.....	.....	3

Counties and Indian reservations.	Horses.				Mules.				Asses.	Sheep.				Swine.	Goats.
	All horses.	Colts under 1 year.	Colts 1 and under 2 years.	Horses 2 years and over.	All mules.	Colts under 1 year.	Colts 1 and under 2 years.	Mules 2 years and over.		All sheep.	Lambs under 1 year.	Ewes 1 year and over.	Rams and wethers 1 year and over.		
The Territory	6,390	170	111	6,109	731	6	7	718	1,466	123	5	60	58	712	1,591
Apache	287	28	23	236	15	1	1	13	5	.....	.....	.....	.....	76	183
Cochise	665	10	8	647	66	.....	.....	66	39	.....	.....	.....	.....	1	.....
Coconino	190	3	.....	187	3	.....	.....	3	15	.....	.....	.....	.....	7	.....
Gila	424	9	11	404	19	.....	.....	19	190	.....	.....	.....	.....	8	900
Graham	1,019	36	15	968	229	2	4	223	462	9	2	2	5	214	427
Maricopa	1,071	19	14	1,038	68	2	.....	66	86	2	2	.....	.....	3	.....
Mohave	21	.....	.....	21	16	.....	.....	16	.....	.....	.....	.....	.....	.....	.....
Navajo	121	.....	.....	121	11	.....	.....	11	.....	5	.....	3	2	2	.....
Pima	795	5	2	788	73	.....	2	71	19	2	1	1	.....	.....	18
Pinal	429	10	15	404	61	1	.....	60	110	.....	.....	.....	.....	70	31
Santa Cruz	349	7	13	329	67	.....	.....	67	213	1	.....	.....	1	3	.....
Yavapai	613	3	1	609	64	.....	.....	64	284	100	.....	50	50	297	32
Yuma	194	5	1	188	38	.....	.....	38	28	.....	.....	.....	.....	31	.....
Moqui[1]	4	.....	.....	4	.....	.....	.....	.....	3	4	.....	4	.....	.....	.....
Navaho[1]	208	35	8	165	1	.....	.....	1	12	.....	.....	.....	.....	.....	.....

[1] Indian reservation.

TABLE 11.—*Dairy products, and bees and honey, by counties and Indian reservations.*

Counties and Indian reservations.	Dairy products, 1899.									
	Milk.				Cream.		Butter.			
	Number of farms reporting.	Gallons produced.	Gallons sold.	Received from sales.	Gallons sold.	Received from sales.	Number of farms reporting.	Pounds produced.	Pounds sold.	Received from sales.
The Territory	2,493	3,056,109	992,672	$225,363	5,643	$3,868	1,234	379,311	308,974	$52,168
Apache	180	99,150	3,375	684			97	17,580	3,775	1,268
Cochise	121	169,043	56,270	15,356	128	126	44	11,864	4,217	1,657
Coconino	76	48,236	14,560	5,143			50	5,568	750	216
Gila	136	123,692	19,044	6,548	155	233	79	12,466	1,004	383
Graham	359	303,658	22,984	5,058	58	87	333	51,011	14,576	3,847
Maricopa	855	1,473,058	598,000	109,848	4,763	2,585	343	210,506	159,191	37,521
Mohave	47	69,721	5,858	1,141			20	3,074		
Navajo	119	104,265	21,628	7,086			105	11,392	738	202
Pima	102	195,435	112,761	35,641			58	10,928	1,286	511
Pinal	105	119,246	13,873	3,220			35	9,850	5,093	1,400
Santa Cruz	52	48,510	13,125	4,363	21	26	8	572	42	10
Yavapai	265	251,625	90,788	26,114	518	811	51	28,188	14,512	3,948
Yuma	59	44,626	20,284	5,143			6	5,204	3,424	1,116
Colorada River[1]	3	2,600					2	400		
Fort Apache[1]	2	1,144	122	18			2	658	366	89
Gila River and Salt River[1]	11	1,810								
Moqui[1]	1	300					1	50		

Counties and Indian reservations.	Dairy products, 1899.						Bees and honey.					
	Cheese.				Value of products consumed on the farm.	Value of all dairy products.	Number of farms reporting.	Swarms of bees June 1, 1900.	Value of bees June 1, 1900.	Pounds of honey produced, 1899.	Pounds of wax produced, 1899.	Value of honey and wax produced, 1899.
	Number of farms reporting.	Pounds produced.	Pounds sold.	Received from sales.								
The Territory	38	33,305	26,635	$3,969	$245,332	$530,700	489	18,991	$66,603	930,420	13,080	$67,489
Apache	13	4,605	2,762	409	12,148	14,509	2	11	110	540		54
Cochise					20,568	37,707	17	287	1,306	9,380	100	801
Coconino					5,197	10,556	6	23	118	330		58
Gila	1	86			18,940	26,104	33	372	708	4,980		452
Graham	1	52	46	9	25,349	34,350	80	1,172	3,306	29,100	910	2,765
Maricopa	6	13,218	12,189	1,378	82,308	233,640	181	13,677	52,183	787,810	9,030	54,100
Mohave					12,277	13,418	23	429	942	12,160	260	1,274
Navajo	3	630			11,978	19,266	30	193	988	3,590	670	492
Pima	9	9,807	7,487	1,603	10,344	48,099	15	500	823	5,200	190	570
Pinal	2	3,477	2,996	428	14,143	19,191	42	1,087	3,356	35,680	1,050	2,424
Santa Cruz	3	1,430	1,155	142	7,236	11,777	2	75	100	450	20	85
Yavapai					17,863	48,736	40	761	1,331	28,790	430	2,469
Yuma					6,127	12,386	16	399	1,307	12,260	440	1,929
Colorado River [1]					260	260	1	1	5	40		4
Fort Apache [1]					181	288	1	4	20	100		12
Gila River and Salt River [1]					363	363						
Moqui [1]					50	50						

[1] Indian reservation.

TABLE 12.—*Poultry and eggs, by counties and Indian reservations.*

Counties and Indian reservations.	Poultry and eggs.								
	Number of farms reporting.	Number of fowls 3 months old and over, June 1, 1900.				Value of all poultry June 1, 1900.	Value of all poultry raised, 1899.	Dozens of eggs produced, 1899.	Value of all eggs produced, 1899.
		Chickens, including guinea fowls.	Turkeys.	Geese.	Ducks.				
The Territory	3,304	165,200	6,043	840	2,439	$80,798	$114,848	819,507	$163,274
Apache	172	3,735	116	18	27	1,274	2,209	24,270	5,896
Cochise	120	6,768	207	18	72	4,488	7,035	38,580	11,689
Coconino	95	3,051	27	.....	10	1,425	1,836	11,080	2,605
Gila	157	4,865	82	52	43	3,650	3,616	32,440	8,128
Graham	354	20,935	1,162	75	156	9,306	14,849	68,000	14,441
Maricopa	903	74,482	3,022	548	1,130	35,314	48,963	379,210	60,211
Mohave	49	2,453	25	19	135	1,181	1,325	9,070	2,403
Navajo	117	5,139	8	10	75	2,028	2,158	18,110	4,407
Pima	111	8,187	457	4	297	5,195	7,437	40,830	10,499
Pinal	108	8,389	322	13	48	3,629	7,838	62,250	13,056
Santa Cruz	48	1,569	108	25	48	885	1,552	8,690	2,319
Yavapai	341	11,562	317	52	181	6,377	7,818	68,760	15,704
Yuma	92	5,332	124	.....	217	3,166	3,336	22,320	5,338
Colorado River [1]	24	408	.....	.....	.....	121	122	940	222
Fort Apache [1]	4	133	.....	.....	.....	63	50	480	135
Gila River and Salt River [1]	377	5,708	17	.....	.....	1,668	3,468	24,130	3,860
Moqui [1]	150	1,009	49	6	.....	347	361	4,220	816
Navaho [1,2]	1	85	.....	.....	.....	123	10	87	22
Papago [1,3]	81	1,390	.....	.....	.....	558	865	*6,040	1,525

[1] Indian reservation. [2] One report for tribe; not an individual farm. [3] Including nomadic Papago.

TABLE 13.—*Wool, mohair, and goat hair, by counties and Indian reservations.*

A.—WOOL.

Counties and Indian reservations.	Wool, shorn fall of 1899 and spring of 1900.				Counties and Indian reservations.	Wool, shorn fall of 1899 and spring of 1900.			
	Number of farms reporting.	Fleeces shorn.	Weight in pounds of fleeces unwashed.	Value.		Number of farms reporting.	Fleeces shorn.	Weight in pounds of fleeces unwashed.	Value.
The Territory	490	743,561	3,340,637	$424,158	Navajo	25	51,120	373,176	$54,434
					Pima	2	5,900	27,000	3,415
Apache	54	241,931	1,029,316	127,786	Pinal	2	6,300	42,700	5,700
Cochise	2	9,600	76,800	9,720	Yavapai	62	55,508	330,702	47,199
Coconino	29	138,773	959,005	133,865	Yuma	1	2,400	10,050	1,680
Graham	5	4,653	8,772	1,180	Navaho [1], [2]	1	177,323	347,170	27,143
Maricopa	23	12,453	49,706	6,151	Moqui [2]	282	37,480	85,830	5,828
Mohave	2	120	410	57					

B.—MOHAIR AND GOAT HAIR.

Counties and Indian reservations.	Mohair and goat hair, shorn fall of 1899 and spring of 1900.				Counties and Indian reservations.	Mohair and goat hair, shorn fall of 1899 and spring of 1900.			
	Number of farms reporting.	Fleeces shorn.	Weight in pounds of fleeces unwashed.	Value.		Number of farms reporting.	Fleeces shorn.	Weight in pounds of fleeces unwashed.	Value.
The Territory	43	13,874	27,030	$7,326	Navajo	3	173	360	$106
					Pima	1	13	30	12
Gila	17	6,660	14,960	4,179	Yavapai	14	3,350	5,190	1,138
Graham	4	752	1,880	572	Moqui [1]	1	12	20	9
Mohave	3	2,914	4,560	1,310					

[1] Indian reservation.

[2] One report for tribe; not an individual farm.

TABLE 14.—*Vegetables and garden products grown in 1899, by counties and Indian reservations.*

Counties and Indian reservations.	Potatoes.			Sweet potatoes.			Onions.			Miscellaneous vegetables and garden products.	
	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.	Acres.	Value.
The Territory	626	33,927	$33,928	51	4,299	$4,636	47	6,966	$10,827	2,145	$124,791
Apache	34	2,954	2,602				2	600	900	38	1,607
Cochise	23	1,522	1,997	1	57	70	5	558	920	118	12,186
Coconino	405	14,984	13,216				1	38	63	41	2,207
Gila	34	2,175	2,774	1	20	20	2	271	290	114	7,265
Graham	30	3,870	4,280	8	1,092	1,481	14	2,253	3,606	150	7,750
Maricopa	32	2,570	3,044	22	1,651	1,362	8	608	749	257	17,230
Mohave	6	214	221	5	210	320	1	80	132	63	5,386
Navajo	15	1,145	1,077	1	14	14	1	255	402	59	4,597
Pima							1	40	41	263	19,550
Pinal	3	516	523	1	20	20	3	310	520	63	4,155
Santa Cruz	9	1,283	1,520				1	393	630	9	575
Yavapai	31	2,340	2,338	7	755	779	6	1,445	2,384	181	17,212
Yuma	2	136	145	4	440	540	1	80	132	27	2,623
Colorado River[1]										43	1,940
Fort Apache[1]	1	200	175								
Gila River and Salt River[1]	1	18	16	1	40	30				351	7,815
Moqui[1]							1	35	58	240	6,817
Papago[1 2]										67	4,519
Supai and Walapai[1]										61	1,297

[1] Indian reservation.

[2] Including nomadic Papago.

TABLE 15.—*Cereals grown in 1899, by counties and Indian reservations.*

Counties and Indian reservations.	Cereals.								
	Barley.			Buckwheat.			Corn.		
	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.
The Territory	16,270	458,776	$223,985				11,654	204,748	$151,564
Apache	155	3,620	2,889				282	3,855	3,305
Cochise							257	8,140	6,838
Coconino	20	100	90				55	761	619
Gila	277	6,584	5,172				1,194	29,435	24,218
Graham	3,068	88,042	45,623				2,217	50,191	29,844
Maricopa	9,593	275,328	126,101				167	2,416	1,638
Mohave	13	180	118				60	1,100	885
Navajo							430	6,400	4,579
Pima	93	2,130	1,042				217	3,741	2,610
Pinal	1,556	43,400	21,261				346	4,260	3,021
Santa Cruz	39	648	396				123	2,300	2,222
Yavapai	81	2,440	1,700				1,056	21,100	18,431
Yuma	459	14,880	7,585				22	160	110
Colorado River [1]							68	960	568
Fort Apache [1]	154	2,490	1,497				1,179	13,090	10,797
Gila Bend [1]							25	320	195
Gila River and Salt River [1]	110	984	580				890	7,570	4,517
Moqui [1]							1,987	27,109	22,772
Navaho [1]							500	13,000	9,000
Papago [1, 2]	372	6,160	4,023				99	2,320	1,407
San Carlos [1]	310	11,800	5,898				300	3,840	2,303
Supai and Walapai [1]							180	2,680	1,685

TABLE 15.—*Cereals grown in 1899, by counties and Indian reservations*—Continued.

Counties and Indian reservations.	Cereals—continued.											
	Oats.			Rye.			Wheat.			Kafir corn.		
	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.
The Territory	1,641	43,246	$21,144	15	190	$157	24,377	440,252	$270,639			
Apache	1,006	21,030	10,661	4	50	42	907	11,992	9,280			
Cochise							69	920	805			
Coconino	85	1,950	1,180				98	2,010	1,881			
Gila	15	938	450	5	50	50	74	1,387	1,373			
Graham				1	20	15	4,162	100,330	76,058			
Maricopa	292	11,428	4,573				8,908	212,943	114,716			
Mohave							50	1,010	867			
Navajo	148	4,930	2,951	5	70	50	530	10,040	10,141			
Pima	40	1,200	500				17	210	160			
Pinal	10	620	200				1,284	31,050	18,937			
Santa Cruz	17	610	356				10	89	83			
Yavapai	12	270	165				83	2,110	2,264			
Yuma	15	250	100				10	300	180			
Colorado River[1]							34	590	592			
Fort Apache[1]	1	20	8				15	110	91			
Gila Bend[1]							160	1,940	1,162			
Gila River and Salt River[1]							7,077	47,990	28,398			
Moqui[1]												
Navaho[1]												
Papago[1] [2]							416	5,800	3,976			
San Carlos[1]							479	9,400	5,639			
Supai and Walapai[1]							3	40	36			

[1] Indian reservation.

[2] Including nomadic Papago.

TABLE 16.—*Flaxseed, grass seed, and hay and forage grown in 1899, by counties and Indian reservations.*

Counties and Indian reservations.	Flaxseed and grass seed.							Total hay and forage crops.		
	Flaxseed.			Clover seed.		Other grass seeds.				
	Acres.	Bushels.	Value.	Bushels.	Value.	Bushels.	Value.	Acres.	Tons.	Value.
The Territory				1,697	$6,918	55	$40	92,674	177,831	$1,361,422
Apache								1,678	2,455	19,790
Cochise								7,849	10,495	85,189
Coconino								2,827	3,645	44,111
Gila								2,017	4,194	57,082
Graham				22	130			7,455	22,606	161,649
Maricopa				1,675	6,788	55	40	46,457	79,803	490,420
Mohave								708	1,670	17,542
Navajo								1,559	3,051	29,123
Pima								5,499	9,613	76,477
Pinal								4,633	6,987	57,076
Santa Cruz								2,250	3,098	29,486
Yavapai								5,417	11,796	118,451
Yuma								3,585	17,235	163,702
Colorado River[1]								43	44	407
Fort Apache[1]								74	80	782
Gila River and Salt River[1]								251	286	2,359
Papago[1,2]								367	765	7,696
Supai and Walapai[1]								5	8	80

[1] Indian reservation.

[2] Including nomadic Papago.

TABLE 16.—*Flaxseed, grass seed, and hay and forage grown in 1899, by counties and Indian reservations*—Continued.

Counties and Indian reservations.	Hay and forage.														
	Wild salt and prairie grasses.		Millet and Hungarian grasses.		Alfalfa or lucerne.		Clover.		Other tame and cultivated grasses.		Grains cut green for hay.		Forage crops.		
													Sown for forage.		Cornstalks.
	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.	Acres.	Tons.	Tons.
The Territory	10,425	9,524	107	212	65,585	137,270	.....	.....	1,078	1,995	15,349	20,487	3,130	8,016	327
Apache	567	630	36	46	908	1,546	.....	.....	6	12	146	189	15	32	.....
Cochise	4,409	2,320	.....	.....	2,208	6,828	.....	.....	70	160	1,106	1,095	56	92	.....
Coconino	447	569	8	16	377	1,215	.....	.....	112	246	1,868	1,595	15	4	.....
Gila	77	111	11	32	645	1,485	.....	.....	100	136	509	681	675	1,718	31
Graham	2,597	3,659	6	9	3,858	16,873	.....	.....	327	689	364	592	303	713	71
Maricopa	5	6	9	11	42,421	72,241	.....	.....	87	152	3,090	4,453	845	2,940	.....
Mohave	10	15	.....	.....	588	1,490	.....	.....	.....	.....	50	65	60	100	.....
Navajo	132	125	.....	.....	1,279	2,692	.....	.....	15	30	98	111	35	80	13
Pima	559	534	.....	.....	1,673	4,564	.....	.....	25	13	3,167	4,206	75	121	175
Pinal	492	562	.....	.....	2,412	3,654	.....	.....	100	266	1,568	2,437	61	68	.....
Santa Cruz	326	196	12	50	366	759	.....	.....	157	187	1,051	1,446	338	460	.....
Yavapai	727	718	21	43	3,637	9,778	.....	.....	62	81	599	595	371	571	10
Yuma	.....	.....	3	3	2,057	13,974	.....	.....	.....	.....	1,273	2,188	252	1,050	20
Colorado River[1]	41	42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2	.....
Fort Apache[1]	30	30	1	2	3	3	.....	.....	.....	.....	40	45	.....	.....	.....
Gila River and Salt River[1]	.....	.....	.....	.....	148	160	.....	.....	17	23	59	31	27	65	7
Papago[1, 2]	6	7	.....	.....	.....	.....	.....	.....	.....	.....	361	758	.....	.....	.....
Supai and Walapai[1]	.....	.....	.....	.....	5	8	.....	.....	.....	.....	.....	.....	.....	.....	.....

[1] Indian reservation.

[2] Including nomadic Papago.

TABLE 17.—*Cereals, hay and forage, potatoes, and tobacco grown on farms of specified classes in 1899.*

Basis of classification.	Class of farm.	Number of farms.	Barley.			Corn.			Oats.		
			Number of farms reporting.	Acres.	Bushels.	Number of farms reporting.	Acres.	Bushels.	Number of farms reporting.	Acres.	Bushels.
	Total	5,809	551	16,270	458,776	1,677	11,654	204,748	147	1,641	43,246
Tenure	Owners	4,784	411	8,065	227,824	1,546	10,329	176,032	118	1,144	32,580
	Part owners	191	44	4,460	130,856	21	192	3,575	6	156	2,922
	Owners and tenants	10	2	82	1,625	3	23	200	1	40	673
	Managers	335	15	903	28,225	22	243	7,333	3	62	1,891
	Cash tenants	300	45	1,744	43,165	28	302	5,436	4	102	1,748
	Share tenants	189	34	1,016	27,081	57	565	12,172	15	137	3,432
	Total	5,809	551	16,270	458,776	1,677	11,654	204,748	147	1,641	43,246
Race of farmer	White	4,006	431	15,307	436,144	630	6,308	133,021	144	1,595	43,156
	Chinese	18	1	15	875	2	13	130			
	Indian	1,769	116	912	20,540	1,042	5,363	70,836	3	46	90
	Negro	16	3	36	1,217	3	30	761			
	Total	5,809	551	16,270	458,776	1,677	11,654	204,748	147	1,641	43,246
Area of farm	Under 3 acres	814	15	105	2,240	266	466	6,424	5	51	1,245
	3 to 9 acres	718	48	100	1,115	434	1,858	21,883	4	14	511
	10 to 19 acres	506	34	177	3,624	183	1,108	12,879	8	23	535
	20 to 49 acres	922	92	1,110	34,392	249	1,532	26,055	42	156	4,136
	50 to 99 acres	674	82	1,511	44,595	155	1,245	24,437	22	266	7,038
	100 to 174 acres	1,581	161	3,935	106,961	315	3,341	60,559	48	675	17,713
	175 to 259 acres	143	39	1,704	46,968	21	284	7,126	5	59	2,419
	260 to 499 acres	268	48	2,773	77,229	36	495	10,992	6	181	4,936
	500 to 999 acres	112	24	2,913	85,892	8	664	18,630	6	194	4,023
	1,000 acres and over	71	8	1,942	55,760	10	661	15,763	1	22	690
	Total	5,809	551	16,270	458,776	1,677	11,654	204,748	147	1,641	43,246
	Irrigated	4,210	533	16,064	455,336	1,202	7,246	135,860	134	1,602	42,711
	Unirrigated	1,599	18	206	3,440	475	4,408	68,888	13	39	535

TABLE 17.—*Cereals, hay and forage, potatoes, and tobacco grown on farms of specified classes in 1899*—Continued.

Basis of classification.	Class of farm.	Rye.			Wheat.			Hay and forage.			Potatoes, including sweet potatoes.			Tobacco.		
		Number of farms reporting.	Acres.	Bushels.	Number of farms reporting.	Acres.	Bushels.	Number of farms reporting.	Acres.	Tons.	Number of farms reporting.	Acres.	Bushels.	Number of farms reporting.	Acres.	Pounds.
	Total	4	15	190	1,317	24,377	440,252	2,639	92,673	127,839	334	677	38,226	1	.....	100
Tenure	Owners	2	6	90	1,136	18,009	298,446	1,991	56,081	102,601	279	504	27,413	.....	.....	.....
	Part owners	.....	.....	.....	50	3,445	83,393	157	10,867	17,467	19	70	2,197	.....	.....	.....
	Owners and tenants	1	4	50	5	67	1,426	6	148	336	2	11	706	.....	.....	.....
	Managers	.....	.....	.....	11	823	17,727	156	12,077	31,418	4	7	301	.....	.....	.....
	Cash tenants	.....	.....	.....	47	989	18,083	199	9,744	17,418	9	51	2,992	1	.....	100
	Share tenants	1	5	50	68	1,044	21,177	130	3,756	8,599	21	34	4,617	.....	.....	.....
	Total	4	15	190	1,317	24,377	440,252	2,639	92,673	177,839	334	677	38,226	1	.....	100
Race of farmer	White	4	15	190	738	16,172	373,252	2,477	91,689	176,015	325	629	35,231	1	.....	100
	Chinese	.....	.....	.....	1	15	560	9	56	117	5	45	2,666	.....	.....	.....
	Indian	.....	.....	.....	577	8,184	66,320	142	663	1,037	3	2	229	.....	.....	.....
	Negro	.....	.....	.....	1	6	120	11	265	670	1	1	100	.....	.....	.....
	Total	4	15	190	1,317	24,377	440,252	2,639	92,673	177,839	334	677	38,226	1	.....	100
Area of farm	Under 3 acres	.....	.....	.....	13	13	150	70	1,333	1,324	4	3	137	.....	.....	.....
	3 to 9 acres	.....	.....	.....	126	705	7,376	68	244	629	14	18	1,769	.....	.....	.....
	10 to 19 acres	.....	.....	.....	219	1,989	23,537	179	1,130	2,744	19	6	481	.....	.....	.....
	20 to 49 acres	1	1	20	384	5,043	68,539	545	7,002	14,774	59	53	5,088	.....	.....	.....
	50 to 99 acres	2	9	100	230	4,324	75,220	451	11,578	23,934	59	78	6,026	.....	.....	.....
	100 to 174 acres	.....	.....	.....	224	4,044	78,308	878	30,180	54,688	136	291	14,652	1	.....	100
	175 to 259 acres	.....	.....	.....	38	839	16,393	114	6,067	12,320	10	44	2,283	.....	.....	.....
	260 to 499 acres	.....	.....	.....	51	2,109	41,766	203	13,671	33,566	23	93	4,949	.....	.....	.....
	500 to 999 acres	1	5	70	24	3,318	82,355	82	11,041	19,707	9	70	2,436	.....	.....	.....
	1,000 acres and over	.....	.....	.....	8	1,993	46,608	49	10,427	14,153	1	21	405	.....	.....	.....
	Total	4	15	190	1,317	24,377	440,252	2,639	92,673	177,839	334	677	38,226	1	.....	100
	Irrigated	4	15	190	1,289	24,137	436,582	2,051	80,363	165,778	192	190	18,659	1	.....	100
	Unirrigated	.....	.....	.....	28	240	3,670	588	12,310	12,061	142	487	19,567	.....	.....	.....

TABLE 18.—*Tobacco, peanuts, dry beans, and dry pease grown in 1899, by counties and Indian reservations.*

Counties and Indian reservations.	Tobacco.			Peanuts.			Dry beans.			Dry pease.		
	Acres.	Pounds.	Value.	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.	Acres.	Bushels.	Value.
The Territory		100	$25	4	234	$238	805	6,637	$12,700	50	866	$1,205
Apache							35	344	879	(1)	6	10
Conchise							24	350	654			
Coconino				3	200	200	(1)	6	17			
Gila				1	30	33	47	582	1,320	6	179	320
Mohave				(1)	4	5	1	17	39			
Navajo							2	32	54	1	10	15
Pima		100	25				68	455	876			
Pinal							58	1,130	2,034			
Santa Cruz							3	80	150			
Yavapai							14	265	598	1	30	60
Yuma							2	15	37			
Colorado River [2]							(1)	5	10			
Fort Apache [2]							4	58	144			
Gila River and Salt River [2]							368	1,783	2,712	15	91	106
Moqui [2]							126	858	1,722			
Papago [2,3]							34	336	829	27	550	694
Supai and Walapai [2]							19	321	625			

[1] Less than 1 acre. [2] Indian reservation. [3] Including nomadic Papago.

TABLE 19.—*Grapes grown and wine and raisins produced in 1899, by counties and Indian reservations.*

Counties and Indian reservations.	Vines.		Grapes, in hundred pounds.				Wine.		Raisins and dried grapes.		Value of grapes, wine, raisins, etc.
	Number of farms reporting.	Number of vines.	Total.	Wine grapes.	Raisin grapes.	Other grapes.	Number of farms reporting.	Gallons made.	Number of farms reporting.	Pounds made.	
The Territory	381	325,187	16,972	2,021	5,001	9,950	6	397			$24,779
Cochise	5	11,538	580			580					642
Coconino	17	1,082	30			30					100
Gila	5	2,090	517			517	1	4			1,107
Graham	69	13,807	278			278					580
Maricopa	215	267,223	14,054	1,967	4,838	7,249	4	378			18,565
Mohave	10	12,978	243	50	163	30	1	15			320
Navajo	20	1,619									
Pima	10	2,144	181			181					450
Pinal	9	7,220	518			518					890
Yavapai	13	4,286	211	4		207					444
Yuma	3	1,128	359			359					1,680
Gila River and Salt River [1]	4	32	1			1					1
Navaho [1] [2]	1	40									

[1] Indian reservation.

[2] One report for tribe, not an individual farm.

TABLE 20.—*Number of orchard trees, of pecan, Persian or English walnut trees, and of unclassified nut trees of bearing ages on farms June 1, 1900, the quantities of fruits and nuts raised in 1899, and the quantities of cider, vinegar, dried or evaporated fruits produced in 1899, together with the value of fruits, nuts, and forest products, by counties and Indian reservations.*

Counties and Indian reservations.	Orchard trees, fruits, and products.												
	Value of all orchard fruits.	Apple.		Apricot.		Cherry.		Peach and nectarine.		Pear.		Plum and prune.	
		Trees.	Bushels.	Trees.	Bushels.	Trees.	Bushels.	Trees.	Bushels.	Trees.	Bushels.	Trees.	Bushels.
The Territory	$96,764	45,592	13,219	47,503	40,466	1,119	220	36,673	37,905	31,950	13,197	17,411	3,104
Apache	22	30	3									80	17
Cochise	5,467	1,702	716	161	58	110	29	1,891	1,007	510	42	103	5
Coconino	840	660	250	36	5	114	60	471	140	179	50	372	
Gila	5,265	810	222	352	356	1		1,201	2,374	98	281	94	50
Graham	10,422	16,352	4,971	1,066	459	74	21	6,174	2,780	1,665	409	3,047	593
Maricopa	42,466	4,080	1,781	42,888	37,011	321	101	24,943	18,585	26,775	11,927	10,168	1,132
Mohave	1,563	877	15	133	37	26	2	2,191	1,179	71	18	127	28
Navajo	20	4,308	36	72		207		1,602		237		1,828	
Pima	1,541	228	98	606	520	4		941	2,484	315	65	182	27
Pinal	3,668	570	100	763	1,088	2		2,198	1,715	388	83	162	72
Santa Cruz		2						4		4			
Yavapai	21,063	15,961	5,027	380	192	260	7	7,453	5,091	1,482	274	1,239	1,180
Yuma	1,085			500	620					200	33		
Gila River and Salt River [1]	1,340	12		162	60			258	1,020	14		9	
Moqui [1]	250							15,541	130				
Papago [1] [2]	15									12	15		
Supai and Walapai [1]	1,737			384	60			1,805	1,400				

[1] Indian reservation.

[2] Including nomadic Papago.

TABLE 20.—*Number of orchard trees, of pecan, Persian or English walnut trees, and of unclassified nut trees of bearing ages on farms June 1, 1900, etc.*—Continued.

Counties and Indian reservations.	Orchard trees, fruits, and products.					Value of forest products.	Nut trees and nuts.						
	Unclassified orchard fruit.		Cider.	Vinegar.	Dried and evaporated fruit.		Value of all nuts.	Pecan.		Persian or English walnut.		Unclassified nut.	
	Trees.	Bushels.	Barrels.	Barrels.	Pounds.			Trees.	Pounds.	Trees.	Pounds.	Trees.	Bushels.
The Territory	9,886	4,615	1	29	135,270	$51,392	$9,312	45	50	13		325	84
Apache						35							
Cochise	1,050	1,100				1,000				2			
Coconino						15,820						5	
Gila	80	15		1	830	51	34						
Graham	543	301		1	1,100	2,923	16			6			
Maricopa	4,933	3,057	1	22	133,340	16,367	8,491	1				220	84
Mohave	2,015					50	115						
Navajo	4			2		33		19					
Pima	340					410	616			5			
Pinal	724	108				345	40	25	50				
Santa Cruz													
Yavapai	168	34		3									
Yuma						20							
Gila River and Salt River [1]													
Moqui [1]													
Papago [1] [2]						10,427							
Supai and Walapai [1]	29					3,911							

[1] Indian reservation.

[2] Including nomadic Papago.

TABLE 21.—*Number of almond and cocoanut trees, and of subtropical fruit trees, of bearing ages, on farms June 1, 1900, and the quantities of fruits and nuts grown thereon in 1899, and the gallons of olive oil produced in 1899, together with the value of all of the subtropical fruits, by counties and Indian reservations.*

Counties and Indian reservations.	Nuts and nut trees.				Subtropical fruits and trees.								
	Almond.		Cocoanut.		Value of all subtropical fruits.	Citron.		Fig.		Guava.		Kaki.	
	Trees.	Pounds.	Trees.	100 nuts.		Trees.	Boxes.	Trees.	Pounds.	Trees.	Pounds.	Trees.	Pounds.
The Territory	29,706	116,390			$30,725			4,325	949,140				
Cochise	100												
Gila	20	230			2			53	150				
Graham	34	200			2			88	200				
Maricopa	28,287	106,560			29,846			2,825	902,790				
Mohave	465	1,000			4			95	550				
Navajo	1												
Pima	425	8,000			205			215	13,000				
Pinal	354	400			133			172	7,550				
Santa Cruz	20												
Yavapai								15					
Yuma					505			645	22,400				
Gila River and Salt River[1]					8			11	500				
Supai and Walapai[1]					20			206	2,000				

[1] Indian reservation.

TABLE 21.—*Number of almond and cocoanut trees, and of subtropical fruit trees, of bearing ages, on farms June 1, 1900, etc.*—Continued.

Counties and Indian reservations.	Subtropical fruits and trees.														Gallons of olive oil.
	Lemon.		Lime.		Olive.		Orange.		Pineapple.		Pomelo.		Unclassified tropical fruits.		
	Trees.	Boxes.	Trees.	Boxes.	Trees.	Pounds.	Trees.	Boxes.	Plants.	100.	Trees.	Boxes.	Trees.	Boxes.	
The Territory	1,853	203			1,601	13,150	48,570	11,116			2,799	633	3,541	1,309	198
Cochise											2				
Gila															
Graham											3				
Maricopa	1,348	195			1,572	13,130	48,025	10,865			2,789	633	3,541	1,309	98
Mohave															
Navajo															100
Pima	5				7		30	100			5				
Pinal					20	20	15	1							
Santa Cruz															
Yavapai															
Yuma	500	8					500	150							
Gila River and Salt River[1]					2										
Supai and Walapai[1]															

[1] Indian reservation.

TABLE 22.—*Small fruits grown in 1899, by counties.*

Counties.	Total value of small fruits.	Blackberries and dewberries.		Currants.		Gooseberries.		Raspberries and logan berries.		Strawberries.		Unclassified small fruits.	
		Acres.	Quarts.	Acres.	Quarts.	Acres.	Quarts.	Acres.	Quarts.	Acres.	Quarts.	Acres.	Quarts.
The Territory	$12,265	10	8,690	2	3,280	1	1,230	3	1,480	59	109,550	4	5,240
Coconino	218	(1)	110	1	1,740	(1)	40						
Gila	210											2	1,750
Graham	138	(1)	130	(1)	110					1	1,300		
Maricopa	7,894	7	6,290					2	480	49	93,250	(1)	50
Mohave	75	1	500							(1)	300		
Navajo	212			1	1,380	(1)	550						
Pima	2,010									6	10,050		
Pinal	570	1	200									2	3,440
Yavapai	838	1	1,460	(1)	50	1	640	1	1,000	3	4,150		
Yuma	100									(1)	500		

[1] Less than 1 acre.

TABLE 23.—*Sugar cane and sorghum cane grown in 1899, and the quantities of sugar, sirup, and molasses produced on farms in 1899, by counties.*

Counties.	Sugar cane.			Sirup.		Sugar.		Molasses.		Sorghum cane.			Sorghum sirup.	
	Acres.	Tons sold.	Received from sales.	Gallons.	Value.	Pounds.	Value.	Gallons.	Value.	Acres.	Tons sold.	Received from sales.	Gallons.	Value.
The Territory	49	109	$620	438	$228					259	485	$1,861	9,031	$4,700
Apache										23	18	98	1,120	865
Cochise										1			40	40
Gila										6	8	32	300	100
Graham										11	5	20	600	461
Maricopa	1	8	40							58	66	200	2,320	1,181
Mohave	2			300	150					7			465	269
Navajo										21			1,436	669
Pima	7	35	175							50	195	575		
Yavapai	39	57	405	138	78					75	193	936	2,100	935
Yuma										7			600	180

TABLE 24.—*Flowers, plants, seeds, and nursery stock grown in 1899, by counties.*

Counties.	Area of glass surface.		Flowers and plants.			Seeds.			Nursery stock.		
	Establishments reporting.	Square feet.	Establishments reporting.	One-fourth acres.	Amount of sales.	Establishments reporting.	One-fourth acres.	Amount of sales.	Establishments reporting.	Acres.	Amount of sales.
The Territory	1	300	2	6	$235				8	14	$2,914
Apache									1		10
Cochise	1	300	1	3	35						
Graham									3	3	840
Maricopa									3	10	2,025
Navajo									1	1	30
Santa Cruz			1	3	200						

ARTESIAN WATER.

Increased attention has been given to the search for a water supply by boring at many widely separated localities. The valley of the San Pedro affords many examples of flowing wells. The conditions generally along this great valley are favorable to success by boring. Similar conditions are found along the Upper Gila, and several flowing wells have been secured in the neighborhood of Safford. The search for petroleum by boring is likely to be rewarded, in some instances at least, by unexpected outbursts of water. There is reason to believe that borings for water would be successful in the valley of the Santa Cruz, although the typical ideal artesian conditions are not visible. Yet in all long valleys with an abundant water supply at the head we may believe that the lower layers of the detrital deposit are charged with water under considerable pressure, though not enough to force the water above the surface.

A 12-inch boring at the level of the San Pedro River, at Benson, to the depth of 500 feet, tapped a supply of water which rose to the surface.

TUBERCULOSIS AND PULMONARY DISEASES.

Arizona has become a veritable Mecca for consumptives and tubercular invalids. The dry, salubrious climate of the Territory has made it a sanitarium of world-wide reputation, and the southern portion of Arizona is fast becoming an asylum for the unfortunate people afflicted with pulmonary ills.

Arizona's advantages in this respect are well appreciated by a large percentage of Eastern medical practitioners. Even thousands come here every year seeking health, and the greater number find it to a degree. Benefit comes not only to those afflicted with pulmonary diseases, but to others stricken with diseases of widely differing natures. Though nature declines to rebuild tissues destroyed, around the towns of central Arizona are to be seen many instances of seemingly miraculous cures, performed by the climate, the dry, pure air doing wonders. Among the business men of Phoenix are many who came here apparently to die, but who are now in the fullness of health. In later years it has been found that the best results, for all afflicted with pulmonary disease, may be obtained by living almost wholly in the open air. North and northeast of Phoenix have arisen villages of tents, populated by health seekers, who spend their days on horseback and their nights where the unconfined and life-giving air can best reach them. Catarrhal, malarial, bronchial, rheumatic, and asthmatic diseases yield readily to the local climatic influences.[1]

While the interests of humanity demand that every opportunity should be afforded to health seekers, and they should not be restrained from obtaining the advantages of this marvelous climate, nor be denied the right to live here, yet where the promiscuous intermingling of people afflicted with contagious diseases with well people is permitted to such an extent as to jeopardize the health of communities, restrictive legislation should be had. This subject is now being agitated in Arizona with a view to the passage of laws and the adoption of regulations which will require segregation and isolation of the sick for the protection of the well. At the same time every proper facility should be afforded the unfortunates to regain their health, through the sanitary influences of the climate, in localities apart from the populated towns and without close intercourse with people in good health.

[1]From a newspaper article by Maj. James H. McClintock.

STOCK RAISING.

Never in the history of Arizona have the prospects been brighter for the stock raisers of the Territory. Heavy rains have been general, resulting in the growth of natural feed on the open ranges, and many sections of the country not generally considered as available cattle range now afford the finest grazing imaginable.

Prices during the past year have been good, and enabled the cattlemen to reap handsome profits, while a brisk demand has continuously obtained.

Shipments from the Territory have been heavy, and have taxed the range men to the utmost to supply the demand. This condition has resulted in an appreciable reduction in the assessed valuations, as will be seen by the figures of the board of equalization, but has stimulated the importation of fine cattle for stock purposes, thousands of thoroughbred cattle having been brought into the Territory or contracted for by our progressive stock raisers.

The general health conditions prevailing with all classes of live stock are perhaps better than in any other section of the United States, owing to the stringency of the live-stock laws and the rigidity with which they are enforced, together with the favorable climatic conditions existing throughout the Territory. Contagious diseases so common in many countries are seldom met with, and such isolated cases as are discovered are promptly dealt with and the trouble stamped out.

The following brief extracts from the last biennial report of the Territorial veterinarian will convey some idea of the health conditions and infrequency of disease among the live stock of the Territory:

The live stock of the Territory are now more nearly free from contagious diseases than at any time in the last ten years. Glanders, which has at times caused the quarantine of large numbers of horses, is almost unknown in the Territory. Fewer tuberculous cattle are found here than in any other State or Territory in the Union. Scabies still exists among some of our sheep, but it is on the decrease.

There has been a great deal of sanitary work, however, during the past two years, due mainly to the large number of people that have immigrated to our Territory from other States, bringing in all classes of live stock. The rules requiring that all shipments of live stock before entering the Territory be reported to the Territorial veterinarian, who admits them either on the presentation of the proper health certificates or inspects them, have reduced the introduction of diseases to a minimum. In many instances diseases have been brought into the Territory by overland immigrant outfits, which, of course, enter without the knowledge of the sanitary authorities. * * *

We are glad to report that there has never been a single case of anthrax reported in Arizona, and this happy condition will continue if all assist in taking every precaution against the introduction of the germs. Reports show that there are tracts of land in Louisiana, California, and other States where no stock can be safely raised unless protected by vaccination. * * *

TUBERCULOSIS AMONG CATTLE IN ARIZONA.

The amount of tuberculosis in a community is dependent upon, first, the amount of tuberculous germs introduced; and, second, on favorable or unfavorable conditions for their multiplication. Most of the early importations of stock into Arizona were for range purposes, and this class of cattle are not as likely to carry tuberculous germs.

The methods of handling range cattle, and the climatic conditions in Arizona as well, are not favorable to the spread of tuberculosis, nor to the multiplication of that germ in animals affected. As to the dairy stock introduced during later years, will state that a badly tubercular-infected herd was brought from California into Arizona before Arizona sanitary laws were enforced. While examining this herd for a prospective purchaser in 1895 several animals were pronounced tubercular. The tuberculin test was applied, which revealed the fact that over 50 per

cent of the entire herd were tubercular. Post-mortem examination corroborated the test and proved that many had been affected for years. The owner of the cattle, Mr. ———, who had brought them from California, stated that he was not aware that his cattle were diseased. It was found on further investigation that several cows had lost flesh and died during the two previous years, while they were in charge of a renter.

In December 1893, 45 head of registered Jersey cattle were shipped into the Salt River Valley from Eolia, Mo., and sold to Mr.——— They were admitted without examination by the present Territorial veterinarian, because accompanied by proper health certificates given by the assistant State veterinarian of Missouri. Shortly afterward they were examined and several were found suffering from tuberculosis. All were tested with tuberculin, and those reacting, about 40 per cent. were destroyed. The balance were retested after ninety days with favorable results, and the quarantine was lifted. (For full report of this work see printed report. this office, 1893-94.)

Several other herds, besides individual cows, have been tested with tuberculin, either because of suspicious symptoms or for the satisfaction of owners, and in nearly every case the animals were found free from disease.

GLANDERS.

In my report for 1893-94 I gave fully the history of the outbreak of glanders among the horses of Mr.——— and others in the vicinity of Tempe and Mesa, during which time fifty glandered horses and mules were destroyed. Though many horses have since been examined in that community, not a single case of glanders has been found, proving that the disease can be entirely stamped out. In 1898, 8 horses and 2 mules affected with glanders were destroyed in the neighborhood of Phoenix, but nearly all of these cases could be traced to one glandered horse, which was supposed to have been driven into the Territory from Utah or California.

During the past two years 581 head of horses and mules have been examined, and 8 horses and 3 mules have been destroyed because affected with glanders.

SWINE.

There has been less disease among the swine of the Territory the past two years than at any time since this industry was started. Hog cholera is still unknown among Arizona swine, and will continue to be if proper precautions are taken in admitting swine into the Territory to prevent the introduction of the deadly cholera germ. All swine breeders should be willing to comply with rigid rules and guard against the introduction of cholera.

Light outbreaks of swine plague have been located a few times during the past two years. The owners were advised to separate the healthy from the diseased hogs and to give them the best of care. In all instances the disease was soon controlled. Swine plague has caused but little loss in the Territory since 1895, when it was estimated that the swine breeders of the Salt River Valley lost upwards of $50,000 from the ravages of this one disease. Though the disease spread that year on to more than sixty ranches, yet by radical measures it was entirely stamped out. * * *

The last legislative assembly enacted laws placing the sheep industry within the jurisdiction of the Territorial veterinarian so far as health regulations are concerned, and these measures will doubtless result in the total eradication of scabies and other common diseases of sheep which have been more or less prevalent in the past.

LAWS GOVERNING THE LIVE STOCK INDUSTRY.

The present live stock laws are a modification of those enacted in 1897, and their enforcement is placed in the hands of a board of three commissioners and a Territorial veterinarian. The live stock sanitary board, as at present constituted, is as follows: Burt Dunlap, chairman, Tucson; William H. Kay, member, Glendale; L. B. Cannon, member, Congress; J. C. Norton, D. V. M. veterinarian, Phœnix; H. Harrison, secretary, Phœnix.

Some important changes were made in the law by the last legislature, principally with a view to rendering the enforcement of the sanitary measures more positive, and also providing for the inspection of the meat of animals slaughtered for food, to preclude the possibility of diseased meat being offered for sale.

Under the provisions of the present law all persons engaged in the business of butchering are required to procure from the live stock sanitary board a license to operate such butchering business, and to file a bond conditioned on the compliance of such provisions of the law as relate to butchers. All cattle purchased for slaughter are inspected for health, and for brands and marks at the time of purchase, and again inspected after slaughter. This regulation is a valuable protection both to the cattleman, butcher, and general public, as it precludes the possibility of animals being slaughtered unless owned by the butcher; the butcher's title to all animals purchased for slaughter is verified and certified to by the inspector, and the inspection of the slaughtered cattle assures the general public that its meat supply is healthy and fit for food.

There are 81 licensed butchers in the Territory, killing an average of 3,150 head of cattle monthly, besides sheep, goats, and hogs, of the number of which the sanitary board has no record.

Another important change in the law is the provision for the inspection of all herds about to be driven from their usual range. In past years large numbers of cattle have drifted from their ranges with herds driven, and this has resulted in considerable loss to various range men. There are over one hundred regularly appointed inspectors, covering as many districts, all of whom report their work to the sanitary board regularly, and in this way a full and complete record is kept of the brands and marks of all live stock shipped or slaughtered in the Territory. All hides of cattle are required to be inspected and tagged prior to the sale or transfer of same from the person owning them to any other person, and in this way the unlawful slaughtering of cattle is largely discouraged.

The assessed valuation of the live stock in the Territory of Arizona, exclusive of sheep and swine, is $3,936,083.27, divided as follows:

Live stock.	Head.	Value.
Horses	43,050	$868,680.02
Mules	1,327	35,232.00
Asses	1,437	9,819.00
Cattle	281,541	3,022,355.25

That these figures are extremely conservative goes without saying, as it is very difficult to arrive at anything like the number of animals in any particular brand that are running at large in so vast a range country as this.

There has been marked interest and activity in the line of horse breeding during the past year, due to the heavy demands for this class of stock both at home and abroad for military use, and as a consequence breeders are looking to the improvement of their herds, and securing better blood for stock purposes than heretofore.

The fact that hundreds of people have launched out into the cattle business in the last two years, as shown by the brand records, is the best criterion as to the healthy commercial condition of the live stock industry in Arizona, and in spite of the fact that upward of 170,000

head of cattle are annually shipped out, there is no appreciable diminution in the numbers of resident stock herds. With the influx of highbred cattle that are contracted for for stock purposes combined with the vast herds already established, the indications are that the near future will see Arizona heading the list of beef producing States.

MINING.

There has been increased activity in all departments of mining work during the year, especially in prospecting for copper and the developing of new copper properties, although gold mining has been remarkably successful. In every mineral-bearing section of Arizona new mines are being opened and profitably worked. As previously reported in former years, the phenomenal production of a few great copper, gold, and silver mines gave the Territory its reputation as a producer of precious metals, but the fact that Arizona possesses incalculable mineral wealth has had tardy recognition. The Territory has never experienced a mining "boom." The development of this industry has been slow, but sure and substantial. Inaccessibility and lack of transportation facilities have been the principal drawbacks. These obstacles have now been largely overcome by the construction of railroads into the most important mining districts. The mistaken idea had prevailed to some extent, also, that Arizona mines do not "go down," and more or less prejudice has been created against the Territory on that account. This erroneous theory has been entirely exploded. Deep mining has proven that values frequently increase in depth. In the Congress mine, at a depth of 3,200 feet, the ore shows great value and strength. In the Gladiator and other mines in the Bradshaw Mountains values increase with depth, and it is not improbable that deeper mines will be worked in Arizona than on the famous Comstock lode of Nevada. During the past year the attention of investors and prospectors outside the Territory has been enlisted as never before, and sales and contracts for sales have been numerous. There has been a notable increase in the production of gold, which will still be more pronounced during the coming year. One of the remarkable features has been the revival in silver mining. The building of new railroads has enabled the owners of silver properties to make shipment of ore at a profit, and in some sections of the Territory silver mining is active and profitable.

The prominence which Arizona has achieved as a steady producer of the precious metals, and the certainty that the production will be augmented in the future justify me in renewing my former recommendation and urging that a Government assay office and a branch mint be established in the Territory. Assay offices are generally conducted at a profit to the Government, and there is every reason to believe that such would be the case with an office established in Arizona, while the substantial encouragement thus held out to the mining industry of the Territory would be very beneficial.

The most extensive individual mining development in progress in the Territory is the reopening of the great Tombstone mines. These mines were among the first to make Arizona famous as a producer of precious metals. The almost fabulous richness of the ore was a subject of comment the world over. The mines were operated under adverse circumstances; remoteness, expensive transportation, and many other drawbacks materially reduced profits.

Tombstone became a large and thriving town, and in a few years

HOTEL BUILT BY SENATOR W. A. CLARK FOR HIS EMPLOYEES AT JEROME, ARIZONA.

THE GREAT UNITED VERDE MINE AT JEROME, YAVAPAI COUNTY, ARIZ. OWNED BY SENATOR W. A. CLARK, OF MONTANA.

the larger mines produced $18,000,000. All of the owners of the principal properties made large fortunes, as fully $6,000,000 of dividends were distributed, the total production of the camp amounted to over $30,000,000; and when the mines closed because the water could not be handled by the means then available, and because the owners could not agree as to methods and division of expense, all competent mining men who knew the district knew that only the cream had been skimmed from the immense ore deposits and that great fortunes were yet untouched in the mines.

Through the earnest efforts of Mr. E. B. Gage and W. F. Staunton, who have no superiors as mining men, all difficulties between owners have been adjusted, titles to all of the best mines have been secured. Ample capital has been subscribed and is now in the treasury of the company organized to reopen the mines—which is being done under the management of Messrs. Gage and Staunton—and everybody familiar with the situation feels the utmost confidence that Tombstone will soon be one of the most prosperous mining camps in the Western country.

The evidence accumulates that Arizona will soon be recognized as the greatest and most profitable mining section of the Union.

The following extracts from the report of the Territorial geologist, Prof. W. P. Blake, treats specifically of the more prominent mines and generally about the magnitude and wealth of the mining industry of Arizona:

NOTES ON THE MINING INDUSTRY.

According to the Mineral Industry, the reports of the American copper refiners for 1900 show a total production of 466,992,663 pounds of electrolytic copper as against 386,410,356 pounds for the year 1899. The production of copper sulphate—"bluestone"—was 78,218,478 pounds in 1900 and 67,903,370 pounds in 1899. The average price of bluestone was 4.99 cents in 1900 and 5.2 cents per pound in 1899.

The Old Dominion smelter, at Globe, for a part of the time produced over 750,000 pounds monthly. Some ore was shipped from the United Globe to the smelter at El Paso, but Dr. Douglas, the general manager of the Phelps-Dodge properties, notes that railway charges in Arizona prohibit that interchange of ores from district to district which would greatly help Arizona's mining and metallurgical interests. Efforts are being made successfully to reduce the cost of transportation, and many new railroad lines are being built and projected which will work a great change for the better in the transporting of mineral products.

Reliable statistics upon the production of gold and silver are not available, but from the best authority obtainable the value of the product of gold and silver mines in the Territory for the year is estimated at fully $6,000,000.

In a former report comprehensive and detailed information was furnished in regard to every mining district in the Territory, and my reports of 1899 and 1900 are considered reliable hand books of reference in this regard.

THE UNITED VERDE COPPER MINES.

The United Verde Copper mines situated at Jerome, 28 miles from Prescott, in Yavapai County, and owned by Senator W. A. Clark, of Montana, have a world-wide reputation. Their production in both copper and gold has been phenomenal. While it is not the policy of the company to furnish detailed information for publication, enough is known to justify the statement that the yield in copper bullion of these mines per month is approximately 3,000,000 pounds. Some months exceed this amount. The bullion contains considerable gold and some silver. The ore bodies in the mines are of great extent and value and can not be exhausted in a lifetime. The mines and reduction works of the United Verde Copper Company are at present employing about 1,500 men. The principal shaft is about 600 feet deep. From different levels tunnels have been driven, and the underground workings are extensive. The engine capacity of the plant amounts to 2,000 horsepower, which is utilized in hoisting ore, operating air drills, copper converters, machine

shops, and a 40-ton crane. A vast amount of ironwork has been put in, consisting of structural works for buildings covering the entire plant, engine and boiler rooms, converters, blast furnaces, machine shops, and foundry. The plant, in some respects, is the most complete in the country, and the converters in use there are said to be the largest in the world. A reverberatory furnace is used in smelting the finer ores, especially those rich in silver. A greater part of the ore when taken out of the mines is first roasted in heaps, extending along the slope of the mountain in three long rows, whereby it is desulphurized. It then goes to the blast furnaces and finally to the converters. The copper bullion which is thus produced is about 99 per cent pure copper. The mines, smelting plant, and the town of Jerome are situated on the east slope of the Black Hills range, pretty well up to the crest, at an altitude of about 5,600 feet above the sea level, and at least 1,800 feet above the Rio Verde Valley, which spreads out in grand panorama to the east and the south. The town contains about 4,000 people. A considerable amount of prospecting is going on in the adjacent territory, and mining is active in that vicinity. The equipment of these mines is thorough and complete in every way, and the property is conceded to be one of the greatest and most valuable in the known world. The equipment of the mines has been increased during the year until the plant is one of the most perfect known.

At the Copper Queen smelter at Bisbee a fifth furnace and another stand of converters were added during the year 1900. All of the product is now in the form of bars by the pneumatic process. A new shaft has been sunk and equipped with steel gallows frame. Other adjoining claims have been acquired, but no great increase of production for 1901 is expected.

The Copper Queen plant consists of five furnaces instead of four and one extra converter, but the output of copper is not increased. The company, is however, now able to turn the whole of its products into Bessemer copper. Any expansion of the smelting works in the present contracted quarters is impossible and is not contemplated, but the advisability of moving the works is under consideration. Some place will be chosen, probably before long, where the works can be laid out upon a broader and more economical plan. It is possible that a site in the Sulphur Spring Valley will be selected at the junction of the company's railroad with the line to Sonora.

The production of copper at Bisbee will be about the same for the year as it was in 1900.

At Morenci the company is not at present erecting more plant which now consists of a new concentrating mill (the old one having been burned in the summer of 1900) and the rebuilt smelter of substantially the same capacity as the old one. The production of copper is between 1,300,000 and 1,400,000 pounds per month and is not likely to be increased.

As shown in former reports, the production of copper in Arizona increased from 15,657,035 pounds in the year 1886 to 110,823,864 pounds in 1898 and to 125,377,785 pounds in 1899. This last amount is the largest in the history of the copper industry in the Territory. It was expected that figures would be exceeded in 1900; but this expectation was not realized. The production for 1900 fell off to 115,403,846 pounds—a loss of 9,973,912 pounds. This is accounted for not by any change in the productive capacity of the mines, but from accidental causes. The mines do not show any signs of impoverishment. The strikes of coal miners in Colorado interfered with the fuel supply. The smelting works of the Detroit Copper Company burned down in June.

The annual yield of the principal copper mines of the Territory for the past six years—from 1895 to 1900, inclusive—is shown in the following table, contributed by Dr. James Douglas to the Mineral Industry for 1900:

Production of principal mines in pounds—fine copper.

Mines.	1895.	1896.	1897.	1898.	1899.	1900.
Arizona Copper Co	11,308,910	13,042,000	13,727,911	18,169,096	19,072,709	19,697,086
Copper Queen	15,741,731	23,298,150	23,999,873	33,749,390	36,901,684	34,382,309
Commercial		46,040				
Detroit Copper Co	3,790,128	7,016,348	8,405,168	11,428,992	13,906,253	10,749,258
Old Dominion		5,650,300	2,000,000	1,800,000	6,300,000	7,155,000
United Verde	16,491,402	22,327,950	31,355,025	42,328,926	43,995,932	39,970,193
United Globe		2,020,565	1,241,975	2,847,460	4,451,180	
Other mines	997,232	344,268	299,000	500,000	750,000	3,450,000
Total	48,329,403	73,745,321	81,019,922	110,823,864	125,377,758	115,403,846

BISBEE—WORKS OF COPPER QUEEN COMPANY.

CLIFTON PLANT OF ARIZONA COPPER COMPANY, LIMITED.

At the works of the Arizona Copper Company, at Clifton, and of the Detroit Company, at Morenci, gas engines of the Crowley "Otto" type have been successfully used.

The smelter at the Helvetia Company's camp at Helvetia was destroyed by fire early in the year, and production was stopped until the summer of 1901, when operations were resumed. It is stated that during the period of the reconstruction of the works mining operations were pushed, with the result of opening up large reserves of ore.

Some miles north of Helvetia, and in the same range of mountains, are the claims known as the Cuprite, which, with other adjoining prospects, are now under development. The shaft has been sunk deeper, and shipments of good yellow copper ore have been made to El Paso. This ore occurs in bunches in limestone near contacts with intruded dikes of porphyry. The decay of bunches of the copper and iron pyrites produces solutions, which, attacking the surrounding limestone, causes the precipitation of copper carbonates and oxides, with the formation of cavernous spaces. The limestone walls of these caverns are generally lined with rich carbonate ore, which has replaced the limestone, while the more ferruginous portions of the ore are left in the central portions. The red oxide of copper, cuprite, occurs in this claim and is associated with molybdenite in crusts and scales.

Other similar claims in the vicinity are known as the Green Mountain, or Phelps and Schley group. These ore deposits are in limestone at the contact with porphyry and have yielded ore suitable for shipment from the surface. These mines are a few miles south and east of Vails Station, on the Southern Pacific Railway, where there is a siding and a rapidly growing little town, sustained by the business of the Helvetia and other copper camps of the northern portion of the Santa Rita range of mountains.

The Azurite mines, 20 miles north of Tucson in the Sierritas, have been idle during the year owing to financial difficulties and complications.

At the Twin Group copper mines development work has been continued by former owners, the property having reverted to them by the failure of purchasers to comply with the terms of the bond. A recent report states that the property has again been sold and the first payment made.

High-grade copper ores have been shipped from the Josephine and Connecticut mines in the Josephine Canyon, west of Patagonia.

At the Bradford mine, near Bloxton, 3 miles west of Patagonia, a steam hoist and pump have been added, and drifting for the ore body has been in progress on the 165-foot level.

Considerable shipments of ore have been made from the Peabody mines at Russellville.

At Clifton district it is reported that forty copper claims have been sold to a company under the title of the Clifton Arizona Copper Company, Limited.

At the ancient camp known as the Ajo, where copper was mined and shipped away before the Gadsden purchase, development has been pushed upon a series of veins lying parallel to each other and containing very rich ore. The position of these numerous veins with corresponding strike and dip, and their proximity, render it possible to work them advantageously from a central shaft, from which the veins can be reached by crosscutting. The ore in depth in the main mine consists of copper and bornite. The manager presented an 80 pound mass of the bornite to the museum of the School of Mines.

In Coconino County copper claims lying north of the Colorado River in the Buckskin Mountains, known as the Red Cloud and Bishop mines, are reported sold to the Coconino Copper Company, a New Jersey incorporation.

The Cameron mine in the Grand Canyon, north of Flagstaff, is now being extensively developed and is reported very valuable.

The mines of the Stoddard Copper Company, in Yavapai County, have produced bullion to the value of about $130,000. The plant of this company was the first copper smelter put in operation in the Territory north of the Globe district. The formation is porphyry, lime, and chloritic slate, with numerous and very large "blow-outs" of quartzite and kaolin. Below these, as well as in the slates and porphyry, large masses of carbonate and oxide ores are found, under which leached ground is encountered, bearing all the evidences of the existence of extensive ore bodies at an earlier period. Still deeper, wherever the permanent water level has been reached, rich copper sulphides, carrying gold, are found, justifying the expectation that when the unaltered zone has been reached the ore will be found greatly enriched by the leachings above, as has been the case with several of the largest producing copper mines both in Arizona and Montana.

The Binghamton group of copper mines, located 2 miles north of Stoddard, is regarded as a most promising property. Great quantities of solid sulphide of iron

and copper indicate the presence of an ore body of vast extent, and the result of the development work already done is strong evidence of fulfillment of the promise of the surface.

The Silver Bell mining district has been the scene of renewed activity. The Old Boot smelter is credited with smelting 60 tons of ore a day. A double compartment 500-foot shaft is sinking, and crosscuts are being run with the aid of the new Leyner drills.

The Faison group of claims, about 40 miles (by the road) west of Tucson, has been sold to a syndicate, and are now being surveyed for a patent. These claims are characterized by well-defined quartz lodes of large size, and well mineralized copper and lead ores.

The Black Warrior Copper mine at Globe, in Gila County, has produced little during the year, because the company has been at work developing sulphide ores, from which to make sulphuric acid for leaching purposes. This mine has immense bodies of ore, but very little free smelting, and it is found best and most profitable to precipitate the copper by leaching. As importing sulphuric acid is very expensive, because of the high railroad rates, the company has de ided to develop sulphide ores in the vicinity and to make sulphuric acid at their own reduction works. The property is thoroughly equipped; its management is in the hands of competent business men of wide experience, and it is believed it will become a large producer of copper within the present year.

On Bill Williams Fork, in the southern Mohave County, western Yavapai, and eastern Yuma County, very valuable and extensive copper discoveries have been made.

The Blue Bell Copper Mine, in Yavapai County, is being quietly developed by its wealthy Eastern owners, and all advices are to the effect that it is a very magnificent property.

GOLD.

At the King of Arizona gold mine, at Kofa, Yuma County, the vein has been proved to the depth of 600 feet, and shows perfect continuity and maintenance of its high average assay and working value. The production during the year has been remarkably uniform and satisfactory. A late shipment, for less than one month's work, was valued at $45,000.

The Fortuna, also in Yuma County, and one of the remarkable gold mines of the Territory, has maintained its high record as a producer. The ledge, which was lost for a time at a depth of 900 feet, has been found again at a depth of 1,300 feet, and has its usual value.

At the Commonwealth, Cochise County, a disastrous fire which destroyed the mill prevented production for the greater portion of the year. Immediate preparations were made for the erection of a much larger and finer plant, which was accomplished under energetic management. Eighty 1,000-pound stamps are now dropping upon the ore, crushing over 200 tons daily, after the preliminary breaking by a series of large-size Blake rock breakers. There are practically two mills in line, each driven by a separate compound condensing Corliss engine. The boilers were at first fitted with patent mechanical stokers and coal was used for fuel, but these stokers have been discarded and oil fuel substituted, with a great saving in cost in many ways. The mine is now opened to the eighth level, 800 feet on the incline from the surface, and the vein continues as strong and rich as at any portion above that depth. It gives satisfactory promise for years to come.

The Mammoth mine, in the southern portion of Pinal County, about 60 miles north of Tucson, is one of the prominent gold mines of Arizona, noted for its large bodies of low grade ore. It has long been worked, but during the past four years the management has greatly improved upon former conditions of working, especially in the introduction of the Bleichert system of wire rope transportation, by which the ores are taken at a trifling cost from the mines to the 80-stamp mill on the San Pedro River, 6 miles distant and many feet lower. The whole plant is a very interesting and instructive example of mining, hoisting, transporting, milling, and the final treatment of the tailings by cyaniding. The conditions may be said to have been adverse on all sides. There is no water or timber at the mine, and fuel for motive power at the mill costs $8 to $15 per cord. But with the descending buckets of ore on one side the ascending buckets carry water on the other, effecting a great saving over the cost of hauling, and securing a bountiful supply. It has been proposed to secure water power on the Aravaipa Creek, some 25 miles distant to the mill and to the mine. But as the water supply of the Aravaipa is variable and uncertain this plan may now be superseded by the erection of a power plant on the railway at Tucson and the conveyance of the energy to the mine and mill nearly 50 miles away. In this event it is probable that oil-fuel will be used.

The country rock of the Mammoth and of the Mammoth-Collins group adjoin-

ing is a coarse-grained porphyritic granite, like that at Oracle and the gold fields near Mesa and Florence. This granite is highly colored, over considerable areas, with red oxide of iron, and is traversed by several dykes of fine-grained, light-colored porphyry, in association with which the gold-bearing quartz veins occur. The ore is believed to have averaged in value from $7 to $9 per ton, and it has been free-milling, though the tailings have always been rich, and yielded a harvest to the two companies which have been working them by the cyanide process. Considerable bunches of high-grade lead ore have been encountered in mining, and the mineral cabinets of the country have been enriched by beautiful crystallizations of wulfenite, vanadinite and descloizite.

Extraction of ore has been carried on regularly to a depth of 760 feet, where permanent water has been found, which will necessitate pumping.

The principal stoping ground in the Mammoth has been on a large ore chute or chimney north of the main shaft. From the 200 level down to the 500 level a large amount of ore was extracted from stopes in some places about 60 feet wide. There was no thorough timbering. It was chiefly by stulls and some square sets at intervals. Portion of the walls fell in and left a large cavity between the bottom of the 200 and the 500 foot level. This broken and dangerous ground was a constant menace to the lower levels below the 500, which it was intended to make secure by thorough timbering with square sets. The 600, 700, and 760 were so timbered, using 10-inch square posts, with sills and caps 8 inches by 10 inches. The 600-foot level was specially braced and lagged, with the expectation of resisting any heavy fall of earth from above.

The Mammoth has thus been a great consumer of timber. For the last 3 years an average of 50,000 feet of squared timber per month has been required. The quantity put into the mine has ranged from 40,000 to 80,000 feet, at an average cost of about $47.50 per thousand feet. This timber is all hauled to the mine by teams from the railroad at Tucson, and has been a heavy item in the cost of working the mine.

On the night of the 15th of April, 1901, an extensive caving occurred in the main stopes, but without loss of life or injury to the shaft. It started suddenly, without warning, at the north end of the mine and extended from the surface to the bottom of the workings, 750 feet deep. About an acre of the surface sank down 25 feet or more, and is still slowly settling down, especially at and near the center of the depression.

The plant of the mine was not damaged, being on firm ground south of the main stopes. The southern part of the mine was not affected and the mine work has since proceeded as usual. The damage is regarded as nominal. Most of the ore of the north end of the mine down to the water level at the 760-foot level had been removed, but some broken-down ore remains under the wreck.

This extensive caving and crushing is another example, out of many, of the futility of attempting to hold up a mountain with timbers. Even on the Comstock lode, at Virginia City, within sight almost of the superb pine forests of the Sierra Nevadas, the transfer of large portions of those forests to the interior of the mines in the shape of square sets, framed and set with geometrical precision, served only the temporary purpose of checking incipient caving of the walls and securing the safety of the miners for a time. But when heavy splitting off from the walls began, with crowding at one side or the other, the beautiful symmetry of the square-set structure was impaired and the posts were thrown out of the perpendicular, the structure had more the nature of a trap than a secure shield. So it was at the Emma, in Utah; at the Silver King and the United Verde, in Arizona, and will ever be in mines where there are large stoped spaces with walls liable to split off and fall in. It is only a question of a few months or years, in most cases, when a collapse must come and generally with fatal suddenness and great loss of property and life.*

It is understood that the Mammoth ground has been worked for several years under a lease which has recently expired by limitation. Another, and adjoining group of important mines, known as the Mammoth-Collins, crops out high up on the hill west of the Mammoth shaft, and it can be reached at a great depth and can be worked to great advantage through a cross-cut drift from the 700-foot level of the Mammoth. A new air compressor has been installed at the Mammoth shaft and the work of extending a cross-cut drift over to the Collins and other lodes has commenced. Machine drills are used and the work proceeds rapidly. Simultaneously a winze has been started from the bottom of the Collins workings so as to connect with the drift so as to secure air and better access. It is estimated that the end of the drift will be 1,000 feet or more below the Collins croppings. Judging from croppings of a vein noted between the Mammoth and the Collins some rich lodes will be intersected by the drift before the Collins ground is reached.

Pending this adjustment of the property rights in the Mammoth and other property and the reorganization of the company, work at the mill has stopped and the whole property has been placed in the hands of the former manager as receiver. Work upon the tailings by the cyanide companies is still in progress.

The Tres Amigos gold property, in Santa Cruz County, was reported sold to Eastern parties in May 1901, and is to be reopened and worked on an extended scale. The development to the date of sale consisted of a shaft 175 feet deep and several cross-cut tunnels or drifts.

The McCabe gold mine in Yavapai County was sold in April, 1901 to capitalists from Illinois.

The old Vulture mine has passed under the control of a new company, and shares are offered for sale in New York. It is proposed to sink a new shaft and to thoroughly open up the vein in depth.

In Weaver district, so justly celebrated for its rich placer deposits of coarse gold, vein mining has received renewed attention. The large quartz vein formerly worked is now being actively developed. Reports from the Octave Mining Company show that a body of high-grade ore was opened on the 600-foot level. Forty stamps were running on this ore.

In the Huachuca Mountains, Cochise County, the Exposed Reef Mining Company has been actively developing the large blanket ledge of gold-bearing quartz. It is the intention to treat the crushed quartz directly by the cyanide process. Works with a capacity of 1,000 tons a day have been erected. The grade of this quartz is low, but the quantity is unquestionably very great, and it can be quarried at little cost.

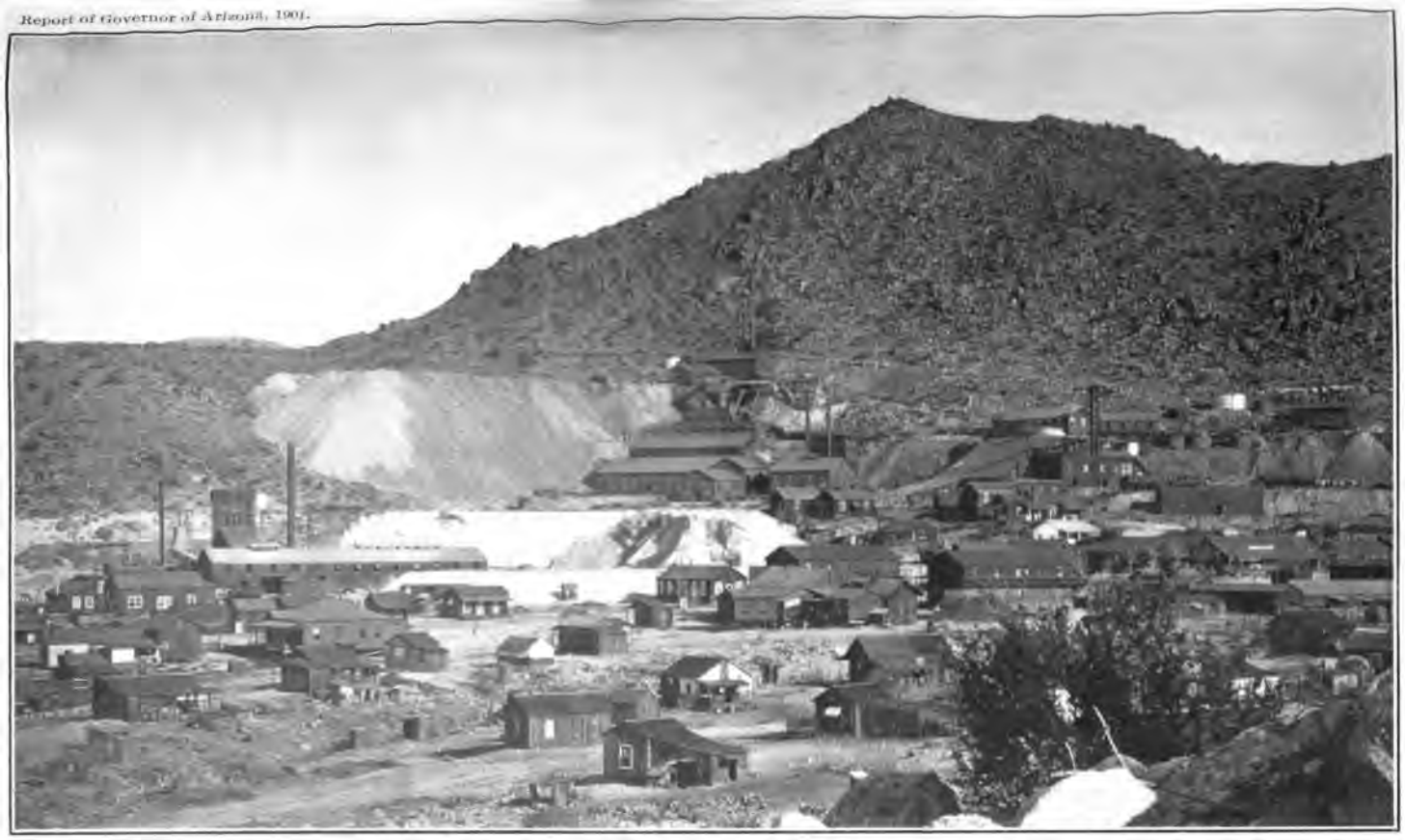
The gold and silver mines at Tombstone, Cochise County, which have been idle for years by reason of the abundance of water at one general level, have united in a plan for unwatering. One large 3-compartment shaft is being sunk, and will be equipped with the best modern hoisting and pumping machinery. The capacity of the new pump will be 1,500 gallons per minute, and under pressure as high as 2,000 gallons per minute, thus being capable of lifting 2,500,000 gallons of water in twenty-four hours. The combined pumping capacity of the Grand Central and Contention mine plants which were operated together before the fire was 1,100 gallons per minute. The shaft is located upon the Flora Morrison ground.

At the Congress mine, Yavapai County, the average production has been well sustained. The vein is now worked to a depth of over 3,100 feet upon the dip, and gives no sign of impoverishment or exhaustion. It is one of the most interesting gold mines of the world. It was visited by the President of the United States during his short stay in Arizona, when on his way to the Pacific coast.

Very extensive additions and improvements have been made to the surface plant of the mines during the year and the underground development work pushed far in advance of the present needs of the reduction works. Among the improvements are an entirely new and thoroughly modern 40-stamp concentrating mill and a new 200-ton cyanide plant. The stamp mill has 1,000-pound stamps, dropping 6 inches 100 times per minute each. The mortars rest on 7-ton cast-iron anvil blocks, which in turn are bolted to concrete piers. The cam shafts are 6½ inches in diameter and the cams and pulleys provided with Blanton fastenings. Two 10 by 20 inch Blake crushers are used. The mill is provided with twelve new standard concentrating tables. The motive power is a tandem compound condensing Reynolds-Corliss engine. In the mill engine room is a cross compound condensing Rand-Corliss air compressor, which furnishes power to the drills, winze hoists, and other labor-saving appliances in and around the mines. An independent boiler house has been provided, and the boilers, four in number, are provided with automatic American stokers and also with crude oil burners, so that either coal or oil may be used as fuel according to the state of the market. The mill is equipped with a good machine shop, blacksmith shop, and electric plant, the latter furnishing lights to the town and mine as well as to the mill. No effort has been spared to make the mill thoroughly up to date in every way. Its capacity is 150 tons per twenty-four hours.

The new cyanide plant has three leaching tanks, each 30 feet in diameter by 8 feet deep. They are charged by 3-ton cars, operated by wire rope, and each tank has four bottom-discharge doors, through which the leached tailings are shoveled to cars underneath the tanks. The new plant has independent solution tanks, but the solutions, after passing through the ore, are handled in the zinc house of the old roasting cyanide plant, which plant is still being operated at full capacity. The combined capacity of the two cyanide plants is 300 tons per twenty-four hours.

A new pumping plant has been established at Date Creek, 6½ miles north of the old Martinez plant, and an abundant supply of good water secured.



THE CONGRESS MINE, WHICH WAS VISITED BY PRESIDENT MCKINLEY AND HIS CABINET IN MAY, 1901.

The old 40-stamp mill is being thoroughly overhauled and provided with new foundations, mortars, etc., and as soon as repairs are completed will be put in service again. It is expected that the combined crushing capacity of the two mills will be 8,000 tons per month.

Besides the work on the Congress vein, sinking is still in progress on the parallel Niagara vein, and a depth of 900 feet has been attained, showing a strong ledge of high-grade ore at that point, with every indication of its continuance to much greater depth.

The policy of the Congress Company in systematically opening their mines far in advance of immediate needs has resulted for many years in a steady, sustained production which may be compared to that of a manufacturing plant, and the well-known excellent results of the policy make it worthy of emulation by other gold-mining companies of the Territory.

SILVER.

In Mojave County several of the old and neglected mines have been reopened and successfully operated. Large amounts of silver-lead ore and concentrates have been shipped to the smelters. The following details respecting several of the more important mines are condensed from the letters of the regular correspondent of the Los Angeles Times, writing under date in April and May, 1901.

In May the Minnesota mine was shipping about 10 carloads of concentrates a month. The main shaft had reached a depth of 500 feet.

At the Tennessee mine the new 100-ton concentrating plant began running in April and was turning out 3 carloads of high-grade concentrates weekly, besides shipments of hand-sorted lump ores.

Operations at the Elkhart recommenced in January. Water in the lower levels caused some inconvenience and delays and a new pumping plant was put in. A new chute of silver-lead ore was found on the 500-foot level. The company in May had decided to sink a new 1,500-foot shaft on the Argyle location. The mill was to be started in a few days upon the newly found ore.

The Pinkham mine was producing gold, silver, and copper ore from the 17-foot ore body.

At the Lucky Dog a new ore chute was proving very satisfactory, being of the same character as that found in other parts of the mine except that the gold and copper was present in greater quantity.

The Schuylkill mine, between the Elkhart and the Tennessee, had its new steam hoist ready for working and another hoist was on the ground for the new 1,500-foot shaft.

In Santa Cruz County mining operations have been active and large shipments of ore have been made from the new town of Patagonia, about 3 miles west of Crittenden. The smelter at that place has been idle for two or three years, but it is proposed to start it again on the ores of the region, including those from the old Salero and Tyndall district, to which a wagon road has been constructed, which extends through the mountains to the Santa Cruz, about a mile and a half above Tubac. This gives access to many well-known silver and lead bearing claims. Some are now being reopened, especially the Trenton and the Bland. In each of these claims, as also at the Mabe and Thunderer and other claims, the croppings are quite black from oxidation of manganese, spar and the ores in depth show a mixture of this spar with galena and argentiferous gray copper ore. At the Trenton a shaft is sinking and being equipped with a hoist. At the Bland there is a tunnel 100 feet long from the face of which a good smelting ore comprised of galena, and gray copper is being taken.

At the World's Fair mine a new strike of very rich silver sulphides, showing wire and moss silver in profusion, was made May, 1901.

The Old Mowry mine is being deepened and explored.

Regular shipments of high-grade argentiferous galena have been made from the Liberty-Clark group. But few of the thousands of mines and prospects in Arizona can be particularly described, and many deserving properties have been no doubt omitted from this report. Until some systematic way is devised for the receiving of detailed reports by districts, it will be impossible to include in a report all mining properties.

Great progress has been made in Yavapai County during the year, and the districts of Big Bug, Lynx Creek, and Groom Creek have shown remarkable development as have the mines in the Bradshaw Mountains and the Santa Maria district. The mining interests throughout the entire country are especially prosperous. The same is true of Pima, Gila, Cochise, Graham, Maricopa, Yuma, Santa Cruz, Pinal, and Mohave counties

WOLFRAMITE.

A few tons of this ore of tungsten have been mined and shipped from the claims north of Dragoon Summit. The greater portion of this was from the alluvial deposits or the gravel and wash in the arroyos near to the croppings of the lodes.

The demand for tungsten and its alloys has not been as great as in the period from 1898 to 1900, and there has not been any activity in mining upon the lodes. The price per ton for 60 per cent ore has fallen. Various reasons are assigned, but the best explanation of the diminished demand and value is found in the fact that new sources have been found in Australia and elsewhere from which the European market has been supplied.

At the Guijas locality, Pima County, where a few years ago some New York capitalists acquired some of the wolframite-bearing veins and proposed to erect a large concentrating plant, the enterprise appears to have been abandoned. The former owners of the property have other claims which they are offering.

Several other localities of wolframite have been brought to public notice through the Arizona School of mines, to which samples of unknown minerals are sent for determination and analysis from all parts of the Territory and from other places. One of the more interesting of such samples came from Mr. F. E. Wager, of Columbia, Ariz., who desired to ascertain its nature and value. It proved to be wolframite of excellent quality and high percentage, though the ore will require concentration to remove the excess of gangue. It occurs near the old Tip Top silver mine, Yavapai County, and was found there some twenty years ago. It crops out in a bunch in a quartz vein in granite, associated with silver ore and antimony.

A deposit of wolframite of considerable magnitude has been opened in Nevada near Osceola. The quality is good and like the Arizona ores contains much more manganese than iron, resembling the ore from Mammoth district, Nye County, Nev., originally described and named Hubnerite by the late E. Riolte, mining engineer, in 1865. Analysis of the original Hubnerite shows the presence of nearly 75 per cent of tungsten acid, 0.56 of iron oxide, and nearly 24 per cent of manganese oxide. Other analysis of ores from various localities in the United States and abroad show a range in the iron oxide of from 0.06 per cent to 4.64 per cent and in the tungstic acid from 73.60 to 76.63 per cent.

Since the original determination by the Arizona School of Mines at the University of Arizona of the occurrence and nature of the tungstic ore of the Territory, much attention has been given to the subject of the proper method of working, and of the determination of the amount of tungstic acid in commercial samples, especially of those from the mill samples and residues from the concentration work, the results of which were given in a former report.

As the nature and value of ores of tungsten continued to be of great interest to our prospectors, miners, and chemists, I introduce here an abstract of a paper upon some method of tungsten determination written by Mr. George Parker as a graduation thesis at the last commencement (June, 1901) of the University of Arizona, at Tucson.

When tungsten trioxide is dissolved in ammonia there results a salt corresponding to the formula $(NH_4)\ 2W_2O_7$, although it does not exist in the solid state. When this solution is allowed to evaporate slowly at the ordinary temperature the crystals that result are long and narrow, and correspond to the formula $(NH_4)\ 2W_2O_7$ plus $2H_2O$ as given by a German chemist. More obtained in the School of Mines laboratory yielded 83.98 per cent of tungsten trioxide, while theoretically this percentage should have been 84.10. When the solution of ammonium tungstate is heated to the crystallizing point the crystals that result are flat and leaf shaped and conform to the formula $(NH_4)\ 6W_7O_{24}$ plus $6H_2O$.

Both of these salts yield tungstic acid by heating, and this probably furnishes one of the easiest means of obtaining the oxide pure.

A common method of determining tungsten in its minerals and one that has been recommended by some writers has been to treat the finely powdered mineral with aqua regia which forms the yellow trioxide, and then to dissolve this in ammonia, leaving behind the insoluble silica. But there are several objections to this method. In the first place aqua regia fails to decompose the wolframite wholly, even though the mineral is ground very fine; and in the second place enough silica goes into the solution with the hot ammonia to materially affect the results.

To overcome these difficulties several methods have been tried, but the following one used in the Arizona School of Mines laboratory seems to give the best results. The finely powdered mineral is fused with a mixture of sodium and potassium carbonate in a platinum crucible until thoroughly decomposed. It is then cooled and dissolved in diluted hydrochloric acid and afterwards evaporated to dryness

in a porcelain canerole several times to dehydrate the silica. It is finally taken up with a mixture of one part hydrochloric acid and five parts of water and the insoluble silica and tungsten are filtered off. The manganese and iron being in the solution in the form of chloride can then be separated by the basic acetate method and determined by trituration with potassium permanganate. The difficulty sometimes experienced in washing the precipitate of tungsten and silica without losing some of the tungsten can be overcome by washing with water containing considerable hydrochloric acid. After thorough washing the filter is carefully dried and is then burned in a platinum dish. The residue which contains the tungsten and silica, after thorough oxidation, is weighed and then the silica driven off with hydro-fluoric acid and determined by ton in weight. What is left after this operation is the pure tungsten trioxide, and as such it can be weighed and determined. The tungsten is generally reported as tungstic acid and the other elements as their oxides. A sample commercial analysis of wolframite or ũbnerite from Arizona yielded—

Tungstic acid (WO_3)	61.34
Iron oxide (FeO)	0.30
Manganese oxide (MnO)	20.06
Silica (SO_2)	6.50

Another method which gave practically the same results although somewhat longer in manipulation consisted in fusing with the alkali carbonates, as before described, but dissolving in water instead of hydrochloric acid. In this case the silica and tungsten go into the solution as tungstate and silicate while the iron and manganese are rendered insoluble and can be removed. The manganese is at first soluble in the form of the manganate, but this soon oxidizes to the permanganate and this to an insoluble oxide.

Having again the two groups they can be separated and determined as in the first method. Sample analysis according to this method gave the same results for iron and manganese as the previous one, but came a little low in tungsten. This was probably due to slight errors in manipulation, as the process was rather tedious.

The fact that tungsten trioxide is easily reduced to an acid solution with zinc, suggested the possibility of determining it by tituration with potassium permanganate by the same process that molybdenum is determined. A number of experiments were made to determine the feasibility of this method. Samples of pure tungsten trioxide were taken and dissolved in ammonia and then reprecipitated with sulphuric acid; this process was found to be necessary since only the precipitated oxide could be reduced. Upon adding zinc the blue suboxide quickly formed and this was still further reduced to an indefinite brownish color.

Upon tituration with at wo-tenths normal solution of potassium per manganate it was easily changed back to the trioxide. The experiment tried did not give very concordant results, the difficulty seeming to be in the reduction of all the tungsten to the same state as before tituration. If some way to overcome this difficulty could be devised there seems to be no reason why this method could not be used to advantage. It would be rapid and would have the advantage of being applicable in the presence of silica. But, until the subject has been investigated more fully, it will be impossible to say whether it is practicable or not. It offers an inviting field for investigation.

PETROLEUM.

The remarkable development of the oil fields of California has greatly stimulated the search for oil in Arizona. Numerous companies have been formed, and drilling has commenced at and near Texas Hill, along the line of the Southern Pacific road. Extensive tracts of land have been surveyed and located with the expectation of finding flowing wells of petroleum. These expectations have yet to be realized. Similarly, in the northern portion of the Santa Rita Mountains, in one of the tributaries of Davidsons Canyon, boring has begun in the dark-colored graphitic shales believed to be of the Coal-Measure age. Borings have also begun near Tempe and a short distance from Phoenix.

A sample of dark viscous petroleum was received at the laboratory of the School of Mines, and was stated to occur in the northern part of the Territory. This requires confirmation. An analysis by the writer showed that it could be separated by distillation into illuminating oil, lubricating oil, and a paraffin residue. The crude mixture has a very strong garlic-like odor.

Many samples of sandstone have been sent to the School of Mines for testing for the presence of petroleum. Among these many came from the Texas Hill region, and were without exception free from any trace of oil. The sandstone consists of

small, well-rounded grains of quartz, cemented together by a deposited coating of black oxide of manganese, which gives the whole mass a black color resembling asphalt or bitumen, which probably it has been supposed to be, and so it was regarded as a good indication of petroleum. Chemical tests showed that the coating could be entirely removed by acid and that asphalt was absent. The solution on standing for some hours gradually became coated with an iridescent film simulating the appearance of oil upon water, which appearance was still further calculated to deceive those whose hopes and expectations were centered upon finding oil. But the film was found to be only manganese oxide, forming on the water in very much the same way that iron oxide forms on stagnant pools.

The use of crude petroleum for fuel in Arizona has been successfully introduced at the railroad shops in Tucson and under the boilers at the new mill at the Commonwealth mine, Pearce. Petroleum is also to be used in the engines upon the road of the Southern Pacific Company. Huge tanks for the reception and storage of the oil have been built at Yuma, Gila Bend, Tucson, and Lordsburg. The tank at Tucson has a capacity of over a million gallons of oil. The petroleum is delivered to it by tank cars from the Beaumont, Tex., wells. It is estimated that this use of petroleum will effect a saving of 50 per cent over the cost of coal as fuel.

Petroleum can be successfully applied in smelting ores, and there are many places in Arizona where it can be used, and to great advantage.

GEOLOGY OF ARIZONA.

The geology of the northern portion of the Territory of Arizona, including the Grand Canyon and the plateau region has been studied and mapped by Powell, Dutton, and others of the United States Geological Survey. Blandy has published some papers relating to central Arizona; the writer has contributed some special papers and desultory notes in reports to the governors of the Territory and elsewhere, but in regard to the country south of the great plateau region very little systematized information has yet appeared in print. An explanation may be found in the fact that the region is vast and difficult of access and until recently has largely been under the domination of the savage Apache.

Captain Dutton, in his monograph upon the Tertiary history of the Grand Canyon district, frequently refers to an unknown "Arizona land." In this he shows a mental reaching out for far-off shores from which a portion, at least, of the mighty mass of sandy sediment in the basin of the Colorado could have been derived.

Investigations in southern Arizona sustain the idea of the former existence of such shores, not perhaps as continental margins but as island ridges, crests of submerged mountain ranges rising at intervals above the waves of shallow seas, and with a trend or direction corresponding essentially to the trend of the mountain ranges of the region.

A cross section of the Territory in a northeast direction from the head of the Gulf of California, the Sea of Cortez, to the line of New Mexico, a distance of nearly 350 miles, shows a succession of mountain ranges separated by long trough-like valleys, often broad plains or mesas. There are some fifteen such main lines or axes of elevation with a general northwest and southeast trend. Commencing first at the Gulf, we have in succession the Gila Range, Mohawk and Castle Dome, Growler Ajo, Maricopa and Quijotoa, Baboquivari, Tucson, Santa Catalina, and Rincons (extending northward to the Bradshaw group of elevations), the Santa Ritas (east of the valley of the Santa Cruz), the Huachucas and Whetstones, the Dragoons and Mule Mountains (Tombstone), extending north into the Galiuro; the Pinaleno and Chiricahua, the Peloncillos east of the San Simon Plains, ending with the Natanes and Prieto Plateau and the Four Peak Mountains.

The several mountain ranges may be considered as successive axes of uplift, or structure, with well-defined occurrences of Paleozoic strata, generally resting upon a foundation of granite and Archæan gneiss. Regular anticlines and synclines are rare. Monoclines are the rule, as, for example, in the Huachucas and Santa Ritas.

The presence in all these ranges of massive strata of quartzite, and frequently of coarse conglomerate referable in age to the Paleozoic, or earlier, bears conclusive testimony to the existence of shore lines and of shallow seas in that early period of continent making. But there are also deep-sea limestones of Devonian and Lower Carboniferous age and other limestones, probably Silurian.

Coal Measures.—In the Chiricahua Mountains we also find evidences of Coal Measures and vegetation of that period in the shales and uplifted beds of graphitic anthracite several feet thick. So also in the San Carlos region and northward heavy strata of the Carboniferous occur with seams of coal, but, so far as yet

determined, of limited thickness and value. These occurrences are, however, sufficient to show a far western extension of the vegetation of the Carboniferous, and consequently the existence of dry or swamp land at that time. The most western point in the latitude of Arizona at which Coal Measures have before been found was in the Rocky Mountains near Santa Fe.[1] Thickly bedded limestones of dark color and of Carboniferous age occur in the mountains west of Tucson. The limestones in the Quijotoa Mountains at the Vekol lead-silver mines contain an abundance of cyathophylloid corals and are referred to the Carboniferous. The dark-colored limestones of the Mule Mountains at Tombstone,[2] and also those at the American mine in the Swisshelms, are similarly referred, and are doubtless a part of the extensive series of limestone and shaly beds of the northern portion of the Santa Ritas, and a portion of the strata of the Whetstone Range and of the Dragoons and of the Galiuro Mountains are of the Carboniferous age.

Cambrian.—Most of the outcrops of massive quartzite uplifted and in contact with granite at several distant places are referred with some hesitation to the Cambrian. Such outcrops are found from western Sonoro in nearly all the chief uplifts as far east as the Chiricahuas. In northern Sonora, near the boundary line, in nearly the southeastern continuation of the Gila and Mohawk uplifts, a well-defined ancient quartzite stands in vertical beds alongside of an intrusive granite. This quartzite is marked by perforations like those of the Potsdam, and are probably properly referable to Scolithus. Conglomerates and quartzites occur in the Baboquivari Range and in the Tucson Mountains, where there is a great thickness of strata in regular folds, probably representing a large part of the Paleozoic. Massive conglomerates with thoroughly rounded pebbles firmly cemented together occur near the source of the Cañada de Oro in the northern part of the Santa Catalina Mountains; also at the American Flag rancho, in the same mountain range. We again find coarse conglomerate opposite the mouth of the Arivaipa, near the site of old Fort Grant, where quartzites also occur resting on granite. Thickly bedded conglomerates occur over wide areas south of Tucson in the region of Arivaca, and again in the northern portion of the Chiricahuas. It is not at present possible to correlate all these occurrences, which no doubt represent different horizons, but they are all believed to be Paleozoic or older. They bear united testimony to the former existence of shore lines and rapid currents in the ancient seas.

Beginning of Arizona land.—The Santa Catalina, Rincon, and Rillito group may be regarded as the southwestern extension of the great mass of mountains in central Arizona, generally known as the Bradshaws. All these mountain ranges consist largely of granitic, gneissic, and schistose rocks of pre-Cambrian age, with a highly complex folded structure, and exhibiting a high degree of metamorphism. Taken together, these mountains may be regarded as the main axis of ancient uplift and of insular land areas in the pre-Cambrian and Paleozoic periods, the beginning of the "Arizona land."

Gneiss.—The gneiss of the southern side of the Santa Catalina near Tucson is regarded as Archæan. It is remarkable for its regularity of stratification and its great thickness, probably over 10,000 feet. It occurs in great tabular masses made up of thin layers, which when seen laterally give the appearance of evenly stratified shales and sandstones. The beds are, however, essentially granitic, with the feldspar spread in nodules, which make protuberances on the cleavage surfaces of the rock, and thus form a porphyritic gneiss or augen-gneiss rock.

Sheets or veins of granite are common in this gneiss. It is remarkable that this rock has such an even tabular structure without plication wrinkling or folding, and that it rests at a low angle, generally not exceeding 20 degrees, upon the massive nucleus of the Catalinas, dipping southward and passing under the modern detrital accumulations, or "wash," from the mountains. These beds rise nearly to the summit of the Catalinas and then break off precipitously, forming a line of cliffs facing the central part of the range. Some obscure traces of an anticlinal fold are visible on the western side.

Huronian or Arizonan.—In the same range, but on the northeastern side, facing the valley of the San Pedro, another formation of thinly bedded and highly crumpled mica schist in sharply defined zigzag folds is referred to the Huronian.

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[1] In 1857 I collected fossil ferns near Santa Fe which the late Mr. Lesquereux identified as specifically the same as several species found in the Pennsylvania Coal Measures. Professor Dana, in his fourth and last edition Manual of Geology (p. 658), says, "A Carboniferous formation without coal is the great fact for the western half of the continent," a statement which in the light of the above facts needs some modification.

[2] See paper on the Geology and Veins of Tombstones, Trans. Am. Inst. Min. Engrs., X, 334.

This is the formation to which has been given the name Arizonan. Still farther north occur the heavy conglomerates, red beds, quartzites, and limestones, in which last corals referable to the Devonian occur. A section carefully measured in detail made here may be generalized as earthy limestone in thin layers with sandstone and quartzite at the base. The strata dip eastwardly at a low angle. Their exact stratigraphic relation to the underlying red shales and sandstones has not been satisfactorily determined.

Devonian.—Near Greaterville in Pima County on the eastern side of the Santa Rita Mountains I have found a locality of Devonian fossils in limestone, and have collected *Spirifer hungerfordi*, *Atrypa recticularis Bellerophon*, and the coral *Acervularia davidsoni*, besides others not yet determined.[1] These occur in a massive bed of light colored limestone standing nearly on edge contiguous to a thick stratum of limestone conglomerate made up of rounded pebbles of limestone, unquestionably derived from some older beds.

In the Box Canyon, which cuts through this mountain from east to west, there is a remarkably interesting section. Resting upon a coarse porphyritic granite at the western side we find in nearly vertical attitude a pebbly conglomerate overlaid by quartzite, and this in turn by a thick series of red shales, probably over 1,000 feet thick. At the eastern end, a last exposure of this section, the fossiliferous limestone, the equivalent of that at Greaterville, and like it, accompanied by the calcareous conglomerate, crops out in such a way as to render its relation to the red shales obscure. There is seemingly a break and want of conformity, as at the Catalina section farther north.

Faulting.—There have been great faultings and displacements over the entire area of Arizona, notably along the valley of the San Pedro northwest and northeast. In the Huachuca Mountains on the western side of this valley the dominant characteristic section is a very heavy regularly stratified quartzite surmounted by limestone and resting upon porphyritic granite and presenting bold escarpments toward the east. In the section of these mountains thick beds of red shales are found, like those of the Santa Ritas, while higher in the range there are massive strata of limestone conglomerate apparently not conformable with the red shales. This conglomerate appears to be the equivalent of that found in close association with the Devonian limestone of Greaterville.

Silurian and Cambrian.—We are without evidence by fossils of the existence of Silurian terranes, but the identification of a Devonian horizon permits us to believe that we have representatives of the Silurian and Cambrian in the underlying strata. The relation of the Devonian limestones to the subjacent beds is under investigation. It is believed that representatives of the Silurian and Cambrian systems will be found, and that in the basal quartzites and conglomerates we have Cambrian beds.

Extensive outcrops of fine-grained mica and clay slates are found in the Dragoon uplift north of Russellville, and beyond, northward.

A region in the eastern part of the Territory covered by the White Mountain Indian Reservation is as yet but little known.

Crystalline rocks.—The underlying foundation rock in southern Arizona is a coarse-grained porphyritic granite which much resembles the typical granite of Belihen in the Vosges.[2] This granite is found in the Santa Ritas, in the Huachucas, at Yuma, and at Oracle at the north end of the Santa Catalina uplift. Here it extends northward to Mammoth and beyond toward Riverside, the Superstition Mountains and Salt River east of Florence. It underlies the tufas and lavas at Gila Buttes at the head of the Florence Canal. It presents generally a broad apparently eroded surface, and here and there includes belts and portions of fragmentary rocks, quartzites, and limestones, as for example in the Gold Field region east of Mesa and on the road from Tucson to Oracle. Large areas of granite exist in the Bradshaw Mountains, notably at and around Prescott. These are granites which weather into fine large bowlders of decomposition at Peeple's Valley, Yavapai County; at points north of Phoenix; at Tombstone and other localities, notably north of Dragoon Summit near the wolfram veins. Plutonic intrusions in the form of dikes abound both in the crystalline and fragmentary formations. Distinct local metamorphism is common where dikes of porphyry cut through limestone, with the production of bordering masses of garnet rock often penetrated by copper sulphide.

A large extinct volcano, Pinacate, rises just below the southern border, near the head of the Gulf of California, but it is not comparable in magnitude and

[1] In the identification of the species mentioned I have had the assistance of Prof. C. E. Beecher, of the Peabody Museum, Yale University.

[2] Vide the series of typical rocks from Krantz of Bonn.

grandeur with San Francisco Mountain near Flagstaff and the neighboring cones dominating the plateau south of the Grand Canyon. Lava streams of comparatively modern date geologically are more abundant in the southwestern portion of Arizona than in the central and eastern portions, but there are considerable areas of rhyolite in the Chiricahuas and of volcanic tuffs and lavas at Tucson, and in the valley of the Hassayampa south of Prescott.

Mesozoic.—Formations of the Mesozoic are not absent in southern Arizona. The massive red sandstones north of Phœnix, of Tempe and Mesa in the Salt River Valley are referred to the Trias. So also the extensively developed red beds of the southern side of the Bradshaws at Castle Creek. East of Tucson, near Vails and Pantano, stratified sandstones and shales are probably Mesozoic. A wide area of disturbed red sandstones and shales between Oracle and the Gila, at old Camp Grant, and apparently unconformable to the uplifted conglomerate, quartzite and limestone, are probably Mesozoic.

In the Whetstone Mountains there are beds which are probably Triassic and Cretaceous. Extensive croppings of red sandstones and shales show a wide area of such rocks in the region traversed by the railway from Benson to Nogales. They dip at low angles and apparently have great thickness. These formations extend from the summit nearly to the old town of Crittenden.

At Nogales there are thickly bedded deposits of volcanic tufa. They are quarried for building purposes.

There are evidences of the presence of Mesozoic sandstones in the Sulphur Spring Valley. The Trias is largely represented south of the international boundary line in Sonora, but the identification in all these localities rests upon stratigraphical and lithological characters rather than upon fossils.

The great and well-defined quartz vein of the Commonwealth mine at Pearce follows approximately the plane of division between a well-defined series of gray and red sandstones and shales, dipping southward, and the overlying series of black andesite and breccia of andesite with which the vein is commingled. The breccia is in some places under the quartz.

Quaternary and recent.—The recent discoveries of remains of Elephas and of the Mastodon at several distant points, and of the horn cores of a giant form of Bos, all indicate former conditions of greater precipitation and of more abundant vegetation than now exist.

Pleistocene lakes.—We also have evidence of extensive interior lakes in the Tertiary or in the Pleistocene period. The valley of the San Pedro exhibits a great thickness of horizontal lacustrine clays, generally of red color, extending from the Mexican border northward to and beyond Benson, on the Southern Pacific Railroad, where they are cut through by the river to a depth of 600 feet or more. Artesian borings have penetrated these deposits 500 feet deeper. The northern barrier of this lake was probably in the valley between Benson and Dudleyville. By the cutting away of this barrier the lake has been drained. For this ancient lake I have proposed the name Quiberi, the ancient Indian name of the San Pedro Valley and River.

The great Sulphur Spring Valley between the Dragoon Mountains on the west and the Chiricahua Mountains on the east is also regarded as the dried-up bed of an ancient lake of great extent.

Detrital deposits.—The detrital deposits of the Pleistocene, or Quaternary, are developed on an enormous scale in southern Arizona. They everywhere skirt the mountains in the form of extended slopes, often 20 miles or more in length, which arrest the eye by their wonderful regularity of outline, truly represented in a photograph or picture by a straight line inclined 2 or 3 degrees to the horizon.

One of the most remarkable of these ancient slopes was recently noted as extending northward from the northern end of the Santa Catalina toward the little mining town of Shultz. This detrital slope is now completely cut off from the parent mountain by erosion. The bed rock is granite. This rock disappears under the high and long ridge made up of great blocks of the rocks which crop farther south. The stage road from Oracle to Mammoth follows this ridge for several miles. Most of this old wash now standing high up above the surrounding region of bed-rock granite is composed of angular or but little rounded blocks mixed with smaller fragments, among which we may recognize the crystallines, the quartzites, sandstones, limestones, and conglomerates of the Catalina Mountains. These materials no doubt occupy an ancient channel. The important economical question is suggested whether or not we have a high placer in the bed of this ancient flow. It seems to be most probable from the fact that gold-bearing veins crop freely at the source.

Similar slopes of detrital materials are found bordering the range farther to the south, and they extend toward the San Pedro River.

All these most extensive deposits show by their magnitude and the weight of

the transported fragments a far greater amount of rainfall formerly than now. The question of transportation by ice in the form of ice may also be considered.

Diatomite.—I have discovered extensive and very interesting deposits of diatomite in the San Pedro Valley. This accumulation of microscopic organism gives additional evidence of the lacustrine nature of the deposits of the San Pedro, for they must have been accumulated in quiet water.

FORESTS.

Arizona has the largest unbroken pine forest in the United States, covering an area of over 10,000 square miles. The timber is usually found at an altitude between 5,500 and 7,500 feet. The principal forest area is in Coconino County and borders on the Grand Canyon of the Colorado, although Gila, Apache, and Yavapai counties have considerable timber. In the Mongollon Mountains in Yavapai, Coconino, Apache, and Gila counties there are large bodies of oak timber suitable for the manufacture of farm machinery, wagons, etc., and finishing lumber, but at present it is too inaccessible to be of great commercial value. The Government has created some large forest reserves in northern Arizona and promulgated rules for their regulation with a view to their preservation from spoliation and to prevent destruction by fire.

The principal lumber mills of Arizona are situated at Flagstaff and Williams, in Coconino County, on the line of the Santa Fe Pacific Railway, and their equipment is modern in every way. The Arizona Lumber and Timber Company, at Flagstaff, and the Saginaw Lumber Company, at Williams, have as complete plants for the manufacture of lumber, boxes, etc., as can be found in the United States.

The forests of Arizona are Sonorean in character and belong to the interior forest area, which covers all the region embraced between the forests of the Pacific and the extreme western limit of the Atlantic region. The forests of much of this area, when compared with those of more humid regions, are more stunted in growth, fewer individuals to a given area, and with much less variation in their composition. However, the forests of the southern portion of this area which includes Arizona are heavy, dense, and valuable when compared with other portions of the interior region.

In this Territory the valuable forests are confined to the higher portions of the Colorado plateau and to the slopes and canyons of our numerous mountains. They attain their highest development in the high San Francisco Mountains, and from here stretch away with more or less extended interruptions to and beyond the Grand Canyon of the Colorado to the north, to Bill Williams Mountain in the west, and southward to the great rim where the Colorado plateau breaks down to the southern plains.

To the southwest, with a number of interruptions, they become dense and heavy in the higher ranges of the White Mountains, and from here extend into western New Mexico. Long arms of forest area also extend into all the mountains immediately south of the Colorado plateau which reach an elevation of more than 7,000 feet. The isolated ranges farther south are also timbered above 7,500 feet. The great forest area embraced in the Coconino and San Francisco region is considered by our greatest authority on American forests as one of the largest unbroken pine forests in the United States. It is almost entirely of yellow pine (*Pinus ponderosa*) and its varietal forms. This species of pine is the most widely disseminated and abundant

MILLS OF THE ARIZONA LUMBER COMPANY, FLAGSTAFF.

VIEW OF YARDS, SAWMILL, AND BOX FACTORY OF SAGINAW LUMBER COMPANY, WILLIAMS. MONTHLY PRODUCT 2,500,000 FEET SAWED LUMBER.

VIEW OF ENGINES AND LOG TR...

MILL AND BOX FACTORY OF ARIZONA LUMBER COMPANY, FLAG

tree of the interior forest area, and in Arizona, where it reaches its highest development, is practically the only tree of commercial importance in the manufacture of lumber.

On the higher mountains of northern Arizona, above the area of yellow pine, are a number of trees usually considered valuable for lumbering purposes, but their restricted area and inaccessibility render them as yet of little commercial value.

INDIGENOUS TREES AND SHRUBS FOR SHADE AND ORNAMENTAL PURPOSES.

The people of Arizona do not properly appreciate the value of native trees and shrubs to plant about their homes for ornamental and shade purposes. We can not expect to bring trees and shrubs from regions where they have been accustomed to humid atmosphere and grow them with any degree of success in Arizona.

We are inclined to look to foreign countries and other States for our ornamental trees and shrubs, when, with a little care in the selection, we can find in our own flora a variety of such plants that will grow with a minimum amount of care and in a few years surpass in appearance anything that we may bring in from the outside. Generations of exposure to the conditions of an arid region enable them to survive and even flourish where plants unaccustomed to such environment perish.

The ash is one of the most valuable trees for street planting. Its growth is rapid and it is but little affected by insects. The cottonwood, although not as desirable as the ash, gives a dense shade during the summer, grows with great rapidity, and requires little care. If care is exercised in planting to plant only staminate trees, no cotton will be produced and the chief objection to their presence removed. The desert willow, a beautiful tree with catalpa-like flowers, one of the most graceful trees in America, grows along the water courses of southern Arizona and should take the place of many trees which we now get from the outside.

It is hoped that the people of Arizona will give more attention to our native trees and shrubs, as they are more in harmony with our surroundings and better adapted to the purpose of landscape gardening. Many of our shrubs are evergreen, while others have attractive flowers or fruits. By proper care in selection they are in the end much more satisfactory and less liable to die than imported plants.

The creation of large reserves by the Government, regulations for their control, and provisions to guard them to prevent forest fires and the destruction of shrubbery and young tree growth by improper grazing in certain localities are wise measures of protection.

GRAZING, FORESTRY, AND WATER SUPPLY FOR IRRIGATION.

Sheep grazing is probably the most important industry of northern Arizona, except mining, and in the counties of Apache, Navajo, and Coconino sheep grazing takes precedence over any other business, and is therefore entitled to the fullest protection, providing no more important interests of the people are jeopardized.

In the three counties named a large proportion of the income used

in maintaining county government is derived from taxing the wool growers' property.

There are large forest reserves within the limits of these counties, but more especially in Coconino, where the Grand Canyon and the San Francisco forest reserves are located; a portion of the Black Mesa Reserve is in Apache and Navajo counties. A sharp controversy has developed within the last year between the irrigationists of the southern counties and the grazers on the northern plateaus, into which the forestry interests have been incidentally drawn. The Government has been petitioned to exclude sheep from grazing on the public domain, within the forest reserves, upon the theory that their presence is destructive to young tree growth, promotes forest fires, denudes the land of grasses and shrubbery, causing the water from the rain and snowfall to be carried off in floods, and in that way lessening the supply for irrigation and shortening the time in which water remains in the streams for the farmers' use. It is argued further by those engaged in farming and irrigation, that the sheep tramping on the hillsides along the sources of the streams loosens the soil, which is carried into the canals and ditches, filling them in time with silt, etc. And that for these reasons grazing, especially in Coconino County, works injury to the agricultural interests and is more destructive than beneficial to the best interests of the Territory. On the other hand, the grazers contend that the presence of sheep within the reserves does not affect the water supply of the farmers, in that but a small portion of the area grazed sheds its water into streams from which water is used for irrigation. The Grand Canyon Reserve especially contributes no water to the south, and but a small part of the San Francisco Reserve is drained southward.

It is also contended by them that sheep very seldom eat young pines, and that their presence affords protection against forest fires, for the reason that when the grass is kept short by grazing there is less to feed the fires; and, further, that there are no streams on the plateaus to carry water off in floods, and it is far better for the water to sink into the porous soil and slowly percolate into the streams at a lower altitude than to be held in suspension on the surface and lost through evaporation. Often several feet of snow in the winter, freezing at night and thawing in the day, all disappears by evaporation, and the ground is dry after the snow is gone. The forestry representatives of the Government have been investigating the subject carefully as to the effect of this grazing upon tree growth, but I am not advised of their conclusions. If I am informed correctly the Secretary of the Interior decided at one time to exclude grazing in the localities referred to, but on investigation it was found that large areas of land had passed into private ownership, over which he had no jurisdiction, and while he could enforce his order of exclusion upon the public domain he could not prevent the owners of land from grazing upon their own property or driving to and from their own land across that belonging to the Government. The Santa Fe Pacific Railroad Company is the owner of grant lands consisting of each alternate section for 40 miles in width on each side of their railroad track. While the company still retains a large acreage, much of the grant has been sold to grazers, lumbermen, etc., and 36,000 acres within the proposed reserve belong to the University of Arizona. In order to make it possible to establish a reserve covering all of the land, and which could be protected by the officers of the Government, and grazers be

entirely excluded, negotiations were commenced with the owners of the lands, who proposed to surrender their holdings to the Government and receive therefor lieu land scrip, with which they could obtain other lands in localities to be agreed upon or consented to by the Secretary of the Interior. This plan was bitterly opposed by the grazers, who were supported by other property owners within the county, on the ground that not only would the wool-growing industry be destroyed but the taxpaying assets of the county would be so reduced that the county government could not be maintained, and that the outstanding bonds against the municipalities would be of little value. As under its charter very little of the railroad company's property is assessable, and if the company's taxable lands should revert to the public domain, and the taxable property of the grazers be driven away, there would be little left to tax in Coconino County to pay the county's debt and maintain government, except the sawmills, which, under the arrangement of exchange, would be permitted to cut but a limited amount of lumber.

The creditors of the county joined in opposing the plan, and the legislature was induced to memorialize the Interior Department against the proposed exchange. Because of this determined opposition, and a misunderstanding which developed as to the amount of land to be exchanged, the Secretary of the Interior declined to take any further action in the premises for the time being, and the disputed questions have not yet been finally settled.

In my judgment an exchange of the lands would be desirable, providing a just recognition of property and county rights could be had. I believe that the railroad company should reimburse the county for the taxes it would lose by returning the taxable lands to the public domain, and I believe that sheep and cattle should be permitted to graze within the reserves upon lands which are not drained to the southern valleys, and therefore save to the county a large taxable asset and prevent the destruction of a valuable industry. If the change is made the railroad company should be required to select lands within the Territory for the open lands exchanged, and timber lands of no greater value than timber land surrendered. If under such an agreement the railroad company would select a large acreage in the southern part of Arizona and assist in building reservoirs and canals to reclaim and operate the land, the Territory would be very materially benefited thereby. No doubt the Territory can find lands equal in value to the university lands within the proposed reserve, and would willingly consent to an exchange. As to the private owners, I am not advised as to what kind of an agreement can be made with them.

NATURAL SCENERY.

Arizona has more magnificent and diversified natural scenery than any other locality in the known world. The Grand Canyon of the Colorado in northern Arizona is indescribable. According to Dutton, "it is a superlative manifestation of natural scenery. No imagination can construct out of its own material any intelligent conception of its awful immensity and splendid beauty. Distinguished savants and celebrated travelers do not hesitate for a moment to pronounce it by far the most sublime of all earthly spectacles. Its colossal buttes, its wealth of ornamentation, the splendor of its colors, and its wonderful atmosphere all combine with infinite perplexity to produce a

scene which at first bewilders and then overpowers. As the mind strives to realize its proportions its spirit is broken and its imagination completely crushed." Science can not grasp its meaning, nor can the genius of poesy and art describe this masterpiece of omnipotent creation.

The way to the canyon is through magnificent forests and beautiful parks of fragrant pines, by picturesque hills and valleys and lofty snow-capped mountains.

A railroad has been constructed from Williams, on the Santa Fe Pacific Railway, to this incomparable gorge, a distance of 65 miles, and a modern hotel, thoroughly up to date in every appointment, is built on the brink of the canyon.

From Flagstaff, a distance of 74 miles, the drive or ride is delightful, the pure mountain air invigorates, and the scenery is beautiful all the way.

Notwithstanding the accessibility of this grandest of earth's natural wonders, comparatively few Americans have been there, and it is stated that more people come from Europe every year to see the canyon than visit it from the United States.

Arizona has great ranges of majestic mountains, towering peaks with summits of snow, bordered by great plains and beautiful valleys; immense forests of pine and oak of unequaled area in the United States; marvelous canyons, with cataracts and waterfalls of indescribable beauty; a forest of petrified or agatized wood unlike anything else in the world; a natural bridge, compared with which the Natural Bridge of Virginia fades into insignificance; great springs of mineralized water, hot and cold, and unexplored caverns of the earth of unknown extent.

HOT SPRINGS.

Arizona is especially favored with thermal springs possessing curative qualities of great value. The waters are very beneficial in curing rheumatism and nervous ailments, and for stomach and kidney troubles, as well as skin and blood diseases. The water from some of the springs, either charged or still, are unexcelled for table use. The Castle Creek Springs, in Yavapai County, are situated among picturesque mountains, and have become popular as a place of resort for pleasure as well as health seekers.

There are many hot springs in the world, but in no other clime is there an open-air pool, fed by unfailing streams of hot medicinal water, where one may bathe at any hour of any day in the year without fear of taking cold.

This pool, fashioned by nature in the midst of towering peaks, has almost perpendicular walls on three sides and the blue Arizona sky for a covering. It is large enough for a comfortable swim. Into it pour unceasing streams of water at a uniform temperature of 114°. So dry and pure is the climate that one may enter this pool at any hour of the day, winter or summer, with absolute safety. These springs have modern hotel accommodations.

The Agua Caliente Springs, in Maricopa County, have become justly famous for the curative qualities of the water, and are a veritable Mecca for invalids troubled with blood or skin diseases. The Agua Caliente Springs, near Tucson, in Pima County, have been popular for their medicinal advantages for many years, and the same is true

RESIDENCE STREET, PHŒNIX.

OLDEST PALM IN PHŒNIX.

of Hookers Hot Springs, in Southeastern Arizona, and the Thermal Springs of Graham County.

The following is an analysis of the water of the Castle Creek Springs, as made by the Division of Chemistry of the Department of Agriculture at Washington. Reaction slightly alkaline:

Grains per United States gallon	43.6
Ammonia	None.
Nitrates	Trace.
Nitrates	None.

The mineral matter has the following composition, expressed in grains per United States gallon:

Sulphate of soda	18.2
Chloride of soda	12.9
Silica	3.5
Bicarbonate of potash	1.1
Bicarbonate of soda	0.2
Bicarbonate of iron	0.7
Bicarbonate of lime	7.0
Alumina	Trace.
Magnesia	Trace.
Lithia	Trace.

As will be seen from the above data, the sample is a mild mineral water. The sample was found to be remarkably free from organic matter or any contamination therewith. It contained a faint trace of lithia as revealed by the spectroscope, but not a sufficient quantity for gravimetric determination.

The temperature of the water is 114°. The other springs have qualities largely similar. The value of these thermal waters for health purposes, when taken in connection with the great salubrity of climate where they are situated, must be admitted.

HUNTING AND FISHING.

It is not generally known that Arizona can boast of some of the finest fishing and hunting in the United States—a veritable paradise for the sportsman. The trout fishing in the Black and San Francisco rivers and in Oak and Clear creeks can not be excelled in the country. Deer, bear, and wild turkey abound in the Mogollon Mountains, and in some sections of the Territory mountain lions, jaguars, wild cats, and lynx are quite numerous. In former years there were a great many elk in southeastern Arizona, although they are now almost if not quite extinct. Beaver, raccoon, and other fur-bearing animals are frequently captured, and wolves, foxes, squirrels, and rabbits are thick in different localities. Quail, ducks, wild pigeons, and doves, and occasionally geese and snipe, are plentiful in season in the lower valleys.

In the White Mountains, south of Fort Apache, on the White and Black rivers and their tributaries, and on both the northern and southern slopes of "Old Baldy," one of the highest mountains in the Territory, midst magnificent forests of pine and oak, along streams of cold mountain water filled with "speckled beauties," and bordering lakes where ducks and other wild fowl abound in season, there is, I believe, better hunting and fishing than can be found elsewhere in America.

EDUCATION.

The public-school system of Arizona is one of the best in the Union. From the primary grades to the university it is liberal and comprehensive, and offers to every child in the Territory an education free of cost. Attendance in the public schools is compulsory.

The course of study has been approved by the National Educational Association. It was prepared with great care, and, as explained by the Territorial superintendent of public instruction in his introduction to the course:

It has been prepared with one object in view—to enable the pupils of the public schools of the Territory to follow from month to month and year to year a plain, simple, progressive line of study that will give them in the end a good common-school education. Its constant aim throughout is:

1. To furnish as a basis for work to principals, teachers, and pupils an outline of the various branches required to be taught in the public schools, arranged in the several grades in accordance with established and approved methods.
2. To unify the work of teachers throughout the Territory.
3. To simplify classification, and thereby make the work of the teacher lighter, but more systematic and effective.
4. To divide the entire course into definite portions, so that a record of the progress and standing of each pupil may be preserved, and the confusion and loss of time resulting from frequent change of teachers avoided.

The work is arranged for eight years, of eight months each—four years in the primary and four in the grammar grade. In districts where school is maintained for a less period than eight months the course must be extended to cover the ground. For instance, if the term is only six months during the year, the pupils will take the first six months' work in each year of the course, and at the beginning of the next year will take up the last two months' work and the first four months of the succeeding year, and so on through the entire course.

Attempt is made to arrange the branches of study by topics throughout the course. These topics in many instances are not in the order taken up by the text-book. The teacher can follow either arrangement without in any way departing from the general course, the only requisite being that he accomplish the work stated in the course, and do it thoroughly.

The methods pointed out in the primary course are designed to be suggestive; the course states what should be taught and the order in which it should be taught; to the individuality of the teacher is left the how to teach the subject. He should remember that he is at liberty to use any or all methods at his command, the only requirement being that he do the work well.

While it is desirable that a pupil shall be in the same grade in all his studies, yet in a country school this is not always practicable, nor is it positively essential. He should be allowed to recite in such grade in each study as he can pursue profitably—perhaps the third in one branch, the fourth in another—but he should be worked up to uniform classification as soon as possible. While the course should be strictly adhered to with pupils attending from year to year, yet a wise discretion should be exercised by principals and teachers in deciding how closely it should be followed with pupils who are only in school a few months, or who, from age or other circumstances, are soon to leave the public schools.

The percentage of illiteracy in the population of Arizona always has been low, and it is believed that our system of education will place the Territory ahead of any State as to the absence of illiteracy.

By reference to the school statistics, herewith presented, it will be seen that the increase in the number of school children since my report of last year is 2,670, the total now being 23,503. This increase is partly accounted for by the fact that under a law enacted last spring the "school age" was advanced from 18 years to 21 years, and partly by the general increase in the population of the Territory.

There are two flourishing normal schools, one at the town of Tempe, near Phoenix, and the other at Flagstaff. Both are under the supervision of able instructors, and there is a large attendance at each. The course of study is thorough and the requirements for graduation most rigid. As a result, no State in the Union has a better class of teachers.

GENERAL SUMMARY.

SCHOOL POPULATION AND ATTENDANCE.

	1899–1900.	1900–1901.
Children between 6 and 18 years of age	20,883	[1]23,503
Children between 8 and 14 years of age	12,416	11,574
Children between 6 and 18 years of age who attended private schools	463	1,483
Children between 6 and 18 years of age who have not attended school	4,583	5,996
Children between 6 and 18 years of age who have attended denominational schools	749	
Children enrolled in the public schools	16,504	17,817
Average daily attendance	10,177	10,744
Percentage of school population enrolled	79¼	76⅔
Percentage of enrollment in daily attendance	61	60

SCHOOL DISTRICTS AND SCHOOLS.

School districts	257	270
New schoolhouses built	17	18
Grammar schools	122	124
Primary schools	276	307
Kindergarten schools	1	0
High schools (under special law)	1	1
Average number of days school was taught	125	128
Volumes in school libraries	8,160	8,922

TEACHERS.

Male teachers employed	109	116
Female teachers employed	290	315
Normal school graduates employed	85	97
Holding first-grade certificates	277	275
Holding second-grade certificates	97	156
Average salary of male teachers	$76.90	$80.61
Average salary of female teachers	$63.40	$64.80
Teachers examined	165	158
First-grade certificates issued	29	16
Second-grade certificates issued	64	66

RECEIPTS AND EXPENDITURES FOR SCHOOL MAINTENANCE.

Apportioned from Territorial school fund	$11,100.88	$11,458.15
Received from county taxes	175,864.29	181,204.74
Received from poll taxes	29,817.68	46,553.64
Received from special taxes for support of schools	12,898.36	9,567.08
Received from licenses, fines, etc	48,849.46	44,118.98
Received from sale of bonds	40,798.33	8,041.95
Expended for teachers' salaries	189,189.62	208,008.92
Expended for contingent expenses, fuel, etc	45,953.32	56,554.47
Expended for school libraries	477.59	366.46
Expended for apparatus	3,053.73	3,335.48
Expended for school furniture	6,477.12	14,875.16
Expended for buildings	54,580.00	17,301.28
Cost of education per capita on school population	11.28	11.25
Cost of education per capita on enrollment	14.24	14.71
Cost of education per capita on attendance	23.10	26.26

SCHOOL PROPERTY AND BONDED DEBT.

Valuation of lots, buildings, and furniture	$502,249.00	$553,181.00
Value of libraries	6,245.00	6,928.00
Value of apparatus	20,530.00	22,103.00
Bonded debt of districts	228,537.00	252,787.00

COST OF SUPERVISION.

Territorial:		
Salaries of superintendent and of board of examiners	$1,350.00	$1,462.50
Printing, postage, and express charges	600.00	600.00
County:		
Salaries of superintendents and of boards of examiners and contingent expenses	7,814.22	7,962.57

[1]Between the ages of 6 and 21.

Comparative table showing advancement during past seventeen years.

Years.	Total receipts.	Total expenditures.	Number of schools.	Number of days school was maintained.	Number of census children.	Average daily attendance.	Valuation of school property.
1885	$186,666.12	$138,164.83	137	120	10,219	3,226	$212,389
1886	159,956.14	135,030.39	150	140	.....	3,507	201,984
1887	120,044.88	117,004.74	169	143	10,303	3,602	176,238
1888	157,707.03	130,212.14	184	124	.....	3,849	222,219
1889	179,782.35	150,543.41	197	135	12,588	4,293	222,958
1890	201,288.70	177,483.83	219	126	12,976	4,702	268,435
1891	236,743.24	198,762.43	237	127	13,874	5,047	297,444
1892	247,201.69	207,897.62	251	124	14,710	5,198	320,609
1893	266,068.87	221,213.28	265	130	15,463	5,340	344,646
1894	205,610.63	176,671.02	289	124	16,203	6,791	405,446
1895	211,277.94	203,016.41	261	120	15,909	7,034	414,447
1896	219,116.10	214,450.88	293	126	16,936	7,641	428,935
1897	219,777.92	205,949.12	337	128	17,427	8,983	445,379
1898	250,278.63	224,185.90	347	130	18,802	9,011	472,107
1899	295,883.91	241,555.94	375	127	19,823	9,396	490,504
1900	421,776.15	345,314.29	398	125	20,833	10,177	529,024
1901	410,458.84	337,253.30	431	128	23,503	10,744	581,860

TERRITORIAL UNIVERSITY.

ORIGIN.

The university was established by an act of the thirteenth legislative assembly of the Territory in 1885. The bill was introduced into the council by Hon. C. C. Stephens, of Tucson, carried through the house by the able efforts of Hon. Selim M. Franklin and approved by the governor March 12, 1885. The university was opened to students in October, 1891.

DESIGN.

The purpose of the University of Arizona is to afford the young men and women of the Territory a general education in science and literature; and so far as possible a technical education adapted to the development of the peculiar resources of Arizona. In furtherance of this latter purpose, instruction is especially provided in agriculture, the mechanic arts, and in mining and metallurgy. The agricultural experiment station, a department of the university, is wholly engaged in developing the agricultural resources of the Territory. The institution aims to fill in the Territory the place occupied in the States by the State universities. That the institution may be of service to all, a subcollegiate department is maintained.

LOCATION AND CLIMATE.

The University of Arizona is located at Tucson, one of the largest towns in the Territory.

Tucson is on the main line of the Southern Pacific Railway, 312 miles west of El Paso, Tex., and 500 miles east of Los Angeles, Cal. The town lies in a broad, flat valley at an elevation of 2,400 feet above sea level and is surrounded by mountains. Its dry, healthful situation with its mild and equable climate has made Tucson a famous winter resort.

The winter climate is especially good; the temperature is cool and strengthening but not severe, the lowest temperature recorded during the average year being about 20° above zero, Fahrenheit. But little rain falls during the winter; fogs are unknown; cloudy days are rare, the percentage of sunshine throughout the winter being greater than that recorded at any other place in the United States. Owing to the extreme dryness of the air, the highest temperatures known are less oppressive to the senses and less dangerous to the health than the summer heat of the Upper Mississippi Valley States. The total amount of rainfall averages less than 12 inches.

SITE.

The university is situated upon high ground about a mile from the business center of the city, with which it is connected by a street-car line. On every *side* it commands a view of mountain scenery of remarkable extent and grandeur.

The location can not be surpassed for healthfulness. The water supply of the university is drawn from a well on the premises 100 feet deep and is of unusually good quality.

BUILDINGS.

The main building is 200 by 105 feet, two stories in height, the first story of gray stone, the second of red brick, and is completely surrounded by a wide two-story veranda. The building contains the offices, recitation rooms, laboratories and apparatus rooms of the various departments, an assembly room, the libraries of the university and experiment station, and the Territorial museum. Adjoining the main building is the mining annex, 80 by 60 feet, equipped with metallurgical machinery.

Three brick houses two stories in height are occupied as homes by the president and instructors.

A dormitory two stories in height, built of gray stone of fine quality, originally provided as a home for male students, has been refitted for the use of young women. It contains a students' dining room, kitchen connected therewith, sixteen rooms each large enough to accommodate two students, and a reception room.

A fine brick dormitory containing forty rooms, with bath and toilet rooms, has been recently built for the use of mail students and teachers.

A substantial brick building contains a suite of rooms for the use of the commercial assaying department, the rooms being furnished with a large melting furnace with necessary muffle furnaces and other accessories.

Joined in continuous structure with the assaying building are the shops of the manual-training department, occupying an area 80 by 95 feet, containing a room for mechanical and free-hand drawing, and the machinery and appliances for the working of wood and iron.

Other buildings are the boiler house, which also contains the wells and pumps whereby the water supply for irrigation and general purposes is obtained; the new greenhouse, 80 by 21 feet; the old greenhouse, used as a propagating house; the cottage occupied by the classes in domestic science; and a temporary wooden building used for various purposes.

The twenty-first legislative assembly of Arizona has authorized the issuing of Territorial bonds to the amount of $25,000 for the purpose of constructing new buildings. It is expected that the erection of a library and museum building, which will also contain administrative offices, will be started as soon as this act of the legislative assembly shall be approved by Congress.

LIBRARY.

The library, containing 6,000 bound volumes and 10,000 pamphlets, is open to the use of all students. The books are new and standard. A valuable feature of the library is the collection of complete sets of scientific and literary periodicals, which are of special service in research work.

A complete title and subject card catalogue is maintained.

The reading room is furnished with about seventy scientific, literary, and general periodicals, besides the weekly Territorial newspapers.

MUSEUM.

The seventeenth legislative assembly of Arizona passed an act establishing a general museum at the university. The object of the museum is to collect materials of all kinds illustrating the resources and development of Arizona, and particularly to preserve historical relics, including those pertaining to the aboriginal inhabitants.

Donations of specimens and collections will be received and acknowledged with thanks, but no special provision has yet been made by the legislature for the support of this department aside from a small appropriation for the salary of a curator.

The collections now displayed at the university comprise representative series of minerals, ores, and rocks of Arizona. Among these may be particularly mentioned superb specimens from the mines of the Copper Queen at Bisbee. There are also collections of typical rocks and minerals for comparison, and many specimens of ores from different parts of the United States and from abroad. Great numbers of valuable specimens are now stored in trays preparatory to classification and distribution in cases. It is desired to make the collection of ores and minerals fully represent the great mineral resources of Arizona.

The museum is indebted to Mr. Herbert Brown, curator, for a large and valuable

collection of skins of the birds of Arizona, which he has deposited in the museum, as well as for a collection of ancient aboriginal pottery and other relics. The fossil skull and teeth of an elephant and other fragmentary remains of extinct animals sent from Yuma by Mr. Brown also deserve special mention.

Historical records of much value are gradually accumulating as a part of this museum, and an appeal is made to old settlers and others to bear this fact in mind when making disposition of articles bearing even remote relation to the early pioneers and their history. All records and data of any nature which can be gleaned are worthy of preservation, and we earnestly desire to have them placed at the university, where they will always be accessible for reference.

The professors at the university have the immediate care of the collections in their respective departments.

The museum has attained very considerable importance and value, and it is expected that it will be safely housed in a special museum building in the near future.

BIOLOGY.

The biological laboratories occupy three rooms on the second floor of the south wing of the main building. The equipment is such as is required for modern instruction and research in the biological sciences. The library and apparatus are well selected and adapted to the region and the courses offered.

The co lections possessed by this department form a very important part of its equipment. The herbarium, consisting of fully 10,000 sheets of mounted plants, 50 cases of insects, articulate and disarticulate human skeletons, plaster and papier-mache models of the important structures of the human anatomy, duplicate material for study and dissection, and the unique flora and fauna of the mountain, mesa, and lowland collecting grounds in close proximity to the institution, offer very attractive opportunities for instruction and research.

CHEMISTRY.

The chemical laboratories are two in number. That used for beginners in the study of general chemistry and qualitative analysis is on the second floor of the main building, and is equipped for the experimental and theoretical study of chemical science.

The chemical apparatus and collections are adequate, the equipment is good. and the arrangements are fairly satisfactory for this work.

The laboratory for quantitative analysis is on the first floor of the main building. It is provided with analytical and bullion balances of the latest model, and is equipped for the teaching of volumetric and gasometric analysis, blow-pipe analysis, metallurgical chemistry, and wet and fire assaying, including apparatus for the electrolytic determination of metals.

Both laboratories, though fairly adequate for their work, are overcrowded, and the time is hoped for when the institution will be possessed of a science building suitably constructed for these purposes.

The laboratory of the experiment station occupies three rooms on the first floor, being devoted to analytical work and chemical investigations relating to agriculture. Though not intended for the use of students, it is of incidental value to the institution through the investigations which are here conducted.

PHYSICS.

Three rooms on the first floor of the main building are set apart for the teaching of physics. The facilities for experimental demonstration of all important phenomena are very complete. The lecture room is fitted with shutters so that it can be darkened. A beam of sunlight directed by a fine clock heliostat outside may be thrown steadily across the lecture table for experiments on light, or used in connection with the solar lantern for a variety of other work. Adjacent to the lecture room are the laboratory and apparatus room. Both lecture room and laboratory are supplied with water and gas.

ENGINEERING.

In a partly developed Territory like our own the engineer is called upon for the solution of a great variety of problems in the various lines of civil, hydraulic, mechanical, and mining engineering, and in many difficult situations he must depend upon his knowledge and inventive ingenuity to supplement a meager equipment. To prepare the engineering student for such experiences the apparatus in this department has been chosen with a view to giving him the greatest

familiarity with the theory, construction, and use of those instruments and machines which observation has shown to be of universal adoption in practical engineering work. Already liberal, it is constantly being enlarged. It embraces surveyors' and engineers' chains; standard field and pocket tapes; plain and solar compasses and transits; mining transits; engineers' levels; stadia, level, and transit rods; aneroid barometers; odometer; automatic water-registers; hook-gauges; three forms of current-meter; stop watch; meteorological instruments; drafting instruments; mechanical calculators; blue-print apparatus; a 4½-inch astronomical telescope with equatorial mountings and accessories; celestial sphere; a 75-light Mather dynamo; a Westinghouse high-speed engine; pumps, steam gauges, indicator, and calorimeters.

AGRICULTURE AND HORTICULTURE.

Because of the situation of the Territorial university, the educational work in agriculture and horticulture has taken peculiar form, being largely conducted on the correspondence plan, particularly through the "Timely Hints for Farmers" issued under the auspices of the experiment station, but of distinct educational value. Three thousand farmers of the Territory are reached regularly twice a month by timely publications on subjects of vital interest.

Small and well-selected agricultural libraries of slight cost have been forwarded to a considerable number who have expressed a willingness to receive them.

It is believed that this method of dealing with our situation will become increasingly useful.

The equipment for agricultural instruction is good, consisting of an excellent seed collection, a greenhouse and gardens for experimental purposes containing many rare and interesting plants, and a well-selected agricultural library.

MINING AND METALLURGY.

Attached to the main building is an annex or mill containing machinery and appliances for crushing, sampling, concentrating, amalgamating, leaching, chloriding, cyaniding, and for the electrical treatment of various kinds of ore in large or small lots. Power is furnished by a 35-horsepower engine.

The mill building has a storage capacity for ore of 50 to 100 tons. A 7-inch by 10-inch Blake crusher is used for coarse crushing, and a Dodge crusher for finer work. Beneath the Blake crusher is a set of 14-inch by 20-inch Cornish rolls from which the ore passes by a conveyor to the main elevator, which carries it up 35 feet to the top of the mill. By means of slides and chutes the crushed ore may be sent at will to various machines to be tested by different methods. For concentration there are provided revolving sizing screens giving facilities for preparing six sizes, besides hydraulic separators for classifying slimes into three grades. The coarser sizes may be worked upon full-sized jigging machines of the Hartz pattern, the finer sizes being jigged upon bottom discharge machines, and the slime worked upon a double Rittinger percussion table, or otherwise, as desired. Amalgamation tests may be made upon a working scale by different methods, including plates and riffles, pans and settlers, etc. A 5-stamp gold mill, with silvered plates and aprons of the latest and most approved construction, by Fraser & Chalmers, of Chicago, permits the working of free-milling gold ores by the usual methods and on a large scale. Several lots of ore have been successfully worked and returns made in gold bullion. In addition to the 5-stamp mill, a smaller prospecting mill of 3 stamps has been added, so as to work small lots of ore of from 100 to 500 pounds.

The assay laboratory is equipped with assay furnaces for crucible work, for scorifying and cupeling, and for retorting mercury from amalgam, besides all needed appliances for assaying by dry and wet methods, including electrolysis. The laboratory also has desks and fittings for the chemical work required in the metallurgical and mineralogical investigation and analysis of ores, mineral fertilizers, and in qualitative tests of minerals.

MANUAL TRAINING.

The manual training building, completed this year largely through the generosity of the Copper Queen Consolidated Mining Company, has a total floor area of 7,900 square feet, divided as follows: Power room and drafting room, each 1,200 square feet; wood-working shop, forge shop, and machine shop, each 1,400 square feet; wash room 600, model room 400, and store room 300 square feet.

Each shop provides working space for 24 students at benches or forges and ample space for machines and tool rooms. The drafting room accommodates 36 students.

The power room contains 2 engines, a dynamo, a blower, and an exhauster.

The wood-working shop is equipped with a full assortment of hand tools, 4 wood-turning lathes, a universal wood worker, a dimension sawing machine, and other modern wood-working appliances.

The forge shop contains 24 down-draft forges, 24 anvils, a blacksmith drill press, and all necessary small tools.

The machine shop contains 2 engine lathes, a shaper, planer, universal milling machine, 24-inch drill, grindstone, vises, and small tools. Other machinery is constantly being added.

The entire building is well lighted and ventilated and the drafting room is heated by steam.

REGISTRATION.

All students are required to register on registration day at the beginning of the year in the president's office. A matriculation fee of $5 is required of all students. No student will be registered until the matriculation fee has been paid. After registration no change in classes can be made without the consent of the committee on registration.

RECORDS.

The class standing of each student is determined by the instructor in charge. The method of ascertaining the student's record is left to the instructor and his report in all cases is final.

Reports of standing in classes are sent each month from the president's office to parents or guardians. Those to whom these reports are addressed are urgently requested to examine each with care and to spur up delinquent students or commend those who are diligent, as the case may be. Without such hearty cooperation good results can not be anticipated.

DISCIPLINE.

It is earnestly desired that students may be influenced to good conduct by higher motives than fear of punishment. The sense of duty and honor, the courtesy characteristic of ladies and gentlemen are appealed to as the best regulators of conduct. It is the policy of the university to allow as much liberty as will not be abused; but good order will be strictly maintained, and misconduct punished by adequate penalties. Frequenting saloons or billiard rooms, or any conduct harmful to the moral standing of the school will render the student liable to punishment, and in aggravated cases to expulsion. Any attempt on the part of a student to present as his own the work of another, or to pass any test or examination by unfair means is considered a most serious offense. In case of expulsion a student is required by law to surrender to the university his cadet uniform.

Students or classes desiring to make requests of the faculty may do so; but to insure immediate action it is necessary for them to file their petition in the president's office before the hour of faculty meeting, and class petitions must be presented at least two days before the time of meeting.

VACATIONS AND HOLIDAYS.

A short recess is taken at Christmas time. The long summer vacation begins about June 1, and continues until near the close of September. The Thanksgiving recess extends, from the close of the regular exercises on the Wednesday before Thanksgiving to the next Monday morning.

All legal holidays are observed by the cessation of ordinary university work.

Appropriate exercises in which the students will be expected to join if required may be arranged by the faculty for any legal holiday.

Arbor day has been formally adopted by the university regents as the regular anniversary on which shall be celebrated the founding of the institution, in connection with the ceremonies of tree planting.

LIVING ACCOMMODATIONS.

Provision is made as far as possible for furnishing board and rooms to students of both sexes upon the university grounds.

Young men have excellent quarters in South Hall, a new dormitory building.

North Hall, the home of the young ladies, is in charge of an experienced and capable preceptress, who has constant supervision of those rooming there.

Rooms contain a clothes press, and are provided with single bedsteads, table, chairs, mirror, washbowl, pitcher, and slop jar. Students will supply their own lamps, brooms, mattresses, pillows, sheets, blankets, towels, napkins, rugs, and such other articles as they may desire for ornamenting their rooms. They will care for their own rooms under the direction of the instructor in charge.

FEES AND EXPENSES.

	Lowest.	Highest.
Tuition, free.		
Matriculation (paid but once)	$5.00	$5.00
Laboratory and shop fees, varying according to courses, per annum	1.00	25.00
Books, per annum	5.00	20.00
Board, per month	15.00	18.00
Lights per room, per month	.25	1.00

By resolution of the board of regents of the university board is to be paid in advance at the beginning of each month. Checks, post-office or express money orders should be made payable to the president. No reduction will be made for absence for a period of less than one week.

Text-books required are obtained directly from the publishers through a book association managed on the cooperative plan under the direction of the faculty.

Members of the battalion will be required to provide themselves with the prescribed uniform, which may be obtained at the university. The cost of uniform, including transportation charges, has been $16.25. This uniform has shown better wearing qualities than a civilian suit of equal cost, and parents are urged to consider the matter of uniform when supplying their sons with clothing for the approaching school year. It may be worn on all occasions, and thus will remove the necessity for the usual expenditures for outer clothing other than overcoats.

Provision has been made, to a limited extent, for the self-support of students.

RAILROAD RATES.

The Southern Pacific, the Maricopa, Phoenix and Salt River Valley, the Santa Fe, Prescott and Phoenix, and the Gila Valley, Globe and Northern railways have all generously allowed students in attendance upon the university half rates when journeying to and from their homes. In the case of students coming to the university these half rates may be secured by notifying the president of the university a sufficient length of time in advance to enable him to secure the permits from the proper authorities. Students at the university may secure transportation to their homes and return at any time by making application at the office of the president of the university.

LITERARY SOCIETY.

The Philomathean Society, an organization open to all students, holds its meetings in the assembly room of the university. Its work embraces general literary exercises and parliamentary usage and is a valuable adjunct to the regular college course.

ATHLETICS.

Encouragement is given to athletics, and athletic organizations are under the immediate care of a committee of the faculty. Membership in these organizations is subject to forfeiture for failure in regular school work.

REQUIREMENTS FOR ADMISSION.

Applicants for admission to any department of the university will be required to furnish satisfactory evidence of good moral character, and of honorable dismissal from the schools with which they were last connected.

Beginning with September, 1903, for admission to the freshman class, applicants must be at least 16 years of age and must pass satisfactory examinations in subjects sufficient to give 15 credits, as described below. Until 1903, 12 credits will be accepted. One study pursued satisfactorily for one year, one period a day, as ordinarily taught in high schools, entitles a student to 1 credit.

For admission to the course leading to the degree of bachelor of philosophy the

subjects upon which examinations must be passed, and the credits assigned each, are:

	Credits.		Credits.
English	3	French or German	2
Mathematics	3	Science	1
General history and civics	1	Elective	2
Latin	3		

For admission to the course leading to the degree of bachelor of science the subjects upon which examinations must be passed, and the credit assigned each, are:

	Credits.		Credits.
English	3	French or German	2
Mathematics	3	Science	3
General history and civics	1	Elective	3

The scope of work required in these various subjects is as follows:

English.—A competent knowledge of the elements of English grammar, composition, the elements of rhetoric and the following English classics or acceptable equivalents: Longfellow's Evangeline, Irving's Sketch Book, Scott's Ivanhoe and Lady of the Lake, Webster's First Bunker Hill Monument Oration, Lowell's Vision of Sir Launfal, Whittier's Snow-Bound, the Sir Roger de Coverley Papers in The Spectator, Shakespeare's Julius Cæsar and Merchant of Venice, Macaulay's Warren Hastings, George Eliot's Silas Marner, Syle's From Milton to Tennyson (ten poems).

In 1903 the requirements for admission will be the same as above for grammar, composition, and the elements of rhetoric with the following English classics: The Sir Roger de Coverley Papers in The Spectator, Goldsmith's Vicar of Wakefield, Tennyson's Princess, Scott's Ivanhoe, George Eliot's Silas Marner, Coleridge's Rime of the Ancient Mariner, Shakespeare's Merchant of Venice and Julius Cæsar, Carlyle's Essay on Burns, Lowell's Vision of Sir Launfal, Macaulay's Essays on Milton and Addison.

Mathematics.—Arithmetic as covered in White's Advanced Arithmetic to the appendix, but these subjects will be omitted in the entrance examinations: longitude and time, present worth, stock investments, exchange, equation of payments, compound proportion, partnership and cube root. Algebra, through quadratic equations, as given in Wells's Essentials of Algebra, or Wentworth's New School Algebra. Plane geometry as treated in the latest editions of Wentworth or Wells.

General history and civics.—As much as is included in Adams's European History and Fiske's Civil Government in the United States or text-books covering equivalent ground.

Latin.[1]—As covered by Collar's First Latin Book and Viri Romæ, together with Allen and Greenough's Grammar and texts; sight reading; Cæsar, four books; Cicero, four orations; Vergil, six books; sight reading from Nepos, Cicero, and Gellius; Daniell's or Bennett's Prose Composition.

French.[1]—As covered by Whitney's French Grammar, Parts I and II; composition; Super's French Reader; Halévy, L'Abbé Constantin; Sand, Le Mare du Diable; Jean de la Brète, Mon Oncle et Mon Curé; and at least 400 pages from five different authors.

German.[1]—As covered by Whitney's German Grammar; composition; Heath's first-year texts; together with Riehl, Der Fluch der Schönheit; Schiller, Marie Stuart and Jungfrau von Orleans; Goethe, Hermann und Dorothea, Iphigenia; Lessing, Minna von Barnhelm.

Science.—Under this head may be offered the required number of credits in the following subjects: Physical geography, physiology, botany, chemistry, physics. At least half the preparation in science should consist of laboratory work. Note-books covering such laboratory work as has been performed by the student should be presented for examination.

Elective.—The remaining credits required may be made up from additional subjects ordinarily taught in high schools.

Students from other institutions of equivalent rank may be admitted to the higher classes upon the presentation of properly authenticated certificates showing to the satisfaction of the faculty that they are qualified to proceed with the desired work.

Arrangements have been made with the Arizona Normal School at Tempe,

[1] If any language is offered it must be to the extent of 2 credits, since a single year's study of a language is not considered of sufficient educational value to be entitled to credit.

whereby students from that institution may have their record transferred to the books of the university with full credit, upon presentation of a certificate duly signed by the principal. Students of this university may also obtain the equivalent privilege at the normal school by presenting the proper certificate of standing, signed by the president.

The faculty desires to establish such relations with high schools and other educational institutions as will enable it to accept their certificates without question. To this end presiding officers are respectfully requested to correspond with the president.

JUNIOR YEAR.

Military science and tactics (4).
Physical culture (4).
English 5, 6 (3).
English 7, 8 (2).
Mathematics 5, 6.
Economics 1, 2 (2).
Economics 3, 4 (3).
Zoology 1, 2.
Mineralogy 1.
History 5, 6 (3).
History 7, 8 (2).
Chemistry 3, 4.
Metallurgy 1.
Drawing 3, 4.

SENIOR YEAR.

Military science and tactics (4).
Physical culture (4).
English 9, 10 (2).
English 11, 12 (3).
Psychology 1.
Pedagogy 1.
History 9, 10 (3).
Astronomy and geology 1, 2.
Logic 1.
Ethics 1.
Metallurgical chemistry and assaying 1, 2.
Steam engineering and prime movers 1, 2.
Engineering construction and hydraulics 1, 2.
Mine engineering 1.

COURSES OF STUDY AND DEGREES.

All facilities and privileges of the university are open to qualified persons of either sex.

The university offers four-year courses of study leading to the degrees of bachelor of philosophy and bachelor of science. In each course the work is partly required and partly elective, as shown by schedules later. Each student taking full work is required to take four hours of recitation work each day. In laboratory work from two to two and one-half hours are considered the equivalent of one recitation hour.

Persons of mature age and with sufficient preparation who are not candidates for a degree will in some cases be admitted to regular classes as special students; provided, however, that in all such cases they show to the satisfaction of the instructors in charge that they can take the work with profit to themselves and without detriment to the work of the regular class.

The faculty reserves the right to omit classes in any course of instruction unless a suitable number of students register for the course.

Students who have completed satisfactorily the required work and the specified amount of elective work as shown in the accompanying schedules will be given the degrees of bachelor of philosophy or bachelor of science. The special character of any course of study may be indicated by adding to the degree the name of the department, as bachelor of science in mining, or bachelor of science in chemistry, etc.

Each candidate for graduation is required to present an acceptable thesis embodying the results of a special study of some subject within the range of the course pursued. The subject of the thesis must be submitted for the approval of the faculty not later than the opening of the second semester of the senior year and the completed thesis must be presented not later than three weeks before commencement day.

The advanced degrees of master of science and master of arts will be conferred upon bachelors, graduates from this university or from institutions of equivalent grade, who have successfully pursued at the university a course of study marked out by the faculty and requiring not less than one year.

COURSES OF INSTRUCTION.

The following schedule shows the courses in which instruction is offered. The courses themselves are explained later.

Military science and tactics or physical culture is required during the freshman

and sophomore years. If for any reason a student is excused from these exercises an additional subject having a minimum of three recitation hours per week will be required.

Numbers within parentheses indicate hours of recitation per week; when no number is given five hours per week is understood.

FRESHMAN YEAR.

Military science and tactics (4).
Physical culture (4).
English 1, 2.
Mathematics 1, 2.
Latin 1, 2.
French 1, 2.
Oratory 1, 2 (2).
German 1, 2.
Spanish 1, 2.
History 1, 2.
Botany 1, 2.
Drawing 1, 2.
Shopwork and drawing 1, 2
Descriptive geometry 1, 2.

SOPHOMORE YEAR.

Military science and tactics (4).
Physical culture (4).
English 3, 4 (3).
Mathematics 3, 4.
Latin 3, 4 (4).
French 3, 4 (4).
German 3, 4 (4).
Oratory 3, 4 (2).
Spanish 3, 4 (4).
Botany 3, 4.
Chemistry 1, 2.
History 3, 4 (2).
Surveying 1, 2.
Physics 1.
Shopwork and drawing 3, 4.

ETHNOLOGY AND ARCHÆOLOGY.

Remarkable discoveries are continually being made of wonderful prehistoric ruins in Arizona. Evidences continue to accumulate of a large population and a high grade of civilization of which no authentic record nor even accepted tradition exists. This field of research, if given a thorough investigation by the Government, can not fail to be of great advantage to science. A majority of the important discoveries lately made have been the result of individual effort by enthusiastic searchers after races that have gone and traces of a lost civilization.

THE LABOR SUPPLY.

The labor supply is fairly up to the demand as a rule, although in a number of instances during the year mine operators have found difficulty in obtaining a sufficient number of skilled miners. The mining districts are always tempting to enterprising prospectors, and many miners are in the habit of dividing their time between employment under others and work for themselves. There is no perceptible excess of laborers in any industry, although, of course, skilled laborers are always most in demand. It may be said with certainty that no able-bodied man need be idle if he is willing to accept hard work.

In the lighter employments, such as clerkships in stores and offices, the supply in Arizona, as elsewhere, is always equal to the demand. At Phoenix and other points it is at times in excess of the demand. This is because such a large number of men come to the Territory in search of health and are willing to accept any work which will yield a living.

There have been no labor disturbances of consequence. There was a strike of a number of surface workmen at the United Verde mines in Jerome in August, the demand being for shorter hours with the same pay; but the strike was not supported by the great mass of the men employed in the works, and it came to an end within a few days by the voluntary return of the men to their former places. There was no violence of any sort.

INDIANS.

The Indians of Arizona are peaceful and industrious and are gressing rapidly in the ways of civilization. Warfare and dep tion no longer menace development and the peace of communities. my judgment the time is ripe to open for sale and settlement the l Indian reservations within the Territory, with the possible exce of the Navajo Reservation, in northeastern Arizona, where condi differ from those in other localities, and where the Indians have l grazing interests. The Pima or Gila River Reservation, consisti agricultural lands only, and which with sufficient water for irriga can maintain a large population, should be made available for pu use, especially the acreage within the reservation in excess of Indian requirements. When it is desirable for the Indians to en in farming, land should be allotted in severalty, and whether in of 40 or 160 acres the Indian individual or family would be be happier, and become quicker civilized if owning and working his farm or homestead, so to speak. And the same is true of the W Mountain and San Carlos reservations, larger in area than som the States of the Union, embracing good agricultural lands in the toms along the Gila, San Carlos, and White rivers, and their tr taries, also rich mineral and grazing lands, and many thousand sq miles of marketable pine and oak timber. All of these valuable la are withheld from improvement and development, and are not utili in any way for the benefit of the Indians, except a small farming a on the bottoms along the rivers.

The tribes occupying these reservations are not, like the Nava and Moquis, pastoral in their customs; otherwise these reservati would maintain several hundred thousand cattle and sheep, which properly managed, would make the Indians practically self-supporti I believe that a further maintenance of the tribal relations as n conducted and the retention of reservation agencies, around which Indians cluster and live in idleness upon rations issued by the Gove ment, most seriously retard the civilization of the Indian. The gr expense of maintaining the present system can also, in my judgme be greatly reduced. If in making farmers of the Indians after la have been allotted it is found beneficial to aid them with farm imp ments and seed and reduced rations for a time until they are fa started, it should be done, and I consider it entirely wise and pro for the Government to build reservoirs for the storage of water irrigation in suitable localities, with canals leading to the allot lands; and for this purpose Indian labor could be very largely utiliz A site for a dam on the Gila at San Carlos has been approved Government engineers and estimates have been submitted for the c struction of the dam. It is stated that this dam when built will st enough water to irrigate land sufficient to maintain all of the Pi Indians and a very considerable acreage besides which could be u ized by white settlers, and that the Government now expends eno money annually to maintain these Indians in comparative idlen to more than pay liberal interest upon the cost of the dam. It wo therefore seem to be a good business move on the part of the Gove ment to make this investment.

But the lands that are not agricultural on these reservations, m eral, grazing, and timber, are of no use whatever to the Indians, a if opened to purchase and settlement they would support a very c siderable population and go far in enriching the country.

Every session of Congress bills are introduced to segregate a portion of some Indian reservation where valuable mineral has been discovered, so that mining can be engaged in or for some other purpose, and this kind of legislation has been in most cases vigorously opposed by the friends of the Indians through misapprehension of the facts and from an honest but mistaken idea as to the effect.

I can see no possible benefit in withholding these large areas, capable of producing great wealth and supporting many people, from being developed and contributing to the wealth of the country, especially as they do not benefit the Indian in the slightest degree in their present condition. It is true that the building of the railroad across the San Carlos Reservation did more to civilize and restrain the Apaches than any previous influence. They have been given more employment and intermingling with the white people has benefited them.

I am informed by the officers of the Santa Fe Railroad that Indian laborers are better than any other kind they employ at section work. If these lands were thrown open, operated, and made productive, the Indians would be given employment, and they would be happier and better. And to assist in the further civilization and education of these Indians, the proceeds from the sale of all lands, mineral and otherwise, within the limits of these reservations, could be assigned by the Indian Bureau. A very large amount of money can be saved to the Government in this way. In the interests of the Indian, to advance his civilization, for the benefit of the country, and because in my judgment it is the wisest, best, and most economical policy for the Government to pursue, I earnestly recommend that these reservations be thrown open to sale and settlement along the lines I have suggested and under such qualified legislation as will best protect the Government and insure to the Indians the maximum benefits to be derived from the disposition of the lands.

Agent G. W. Hayzlett, of the Navahos, reports everything in splendid condition at his agency and the Indians contented and prosperous, which seems to be their condition throughout the Territory, except at the White River Agency. I had occasion to visit that agency during the summer, and I know from personal observation that the Indians there are not properly provided for and much privation exists among them. The agent, Mr. Crouse, is doing everything in his power. He is a very competent agent, and the Indians like him and have confidence in him, but the rations authorized to be issued by the Government are insufficient, and many of the Indians do not have enough to eat. I earnestly recommend that their rations be increased.

The Indian schools of the Territory are well conducted and are doing good work.

The following extract from the report of Superintendent S. M. McCowan, of the Indian school at Phoenix, is interesting:

> There has been no particular change in the condition of the adult Indians living on the reservations of the Territory during the past year. Gradually, but surely, the entire Indian population is becoming civilized. But a very small portion of the Indian tribes in Arizona receive any assistance from the United States Government. Ninety-five per cent of them are independent and self-supporting.
>
> In my opinion, much of the land now owned and in possession of the Indians of the Territory could, with profit to themselves and benefit to the more progressive white race, be sold and opened up to settlement and development. On most of the land now included in Indian reservations will be found splendid mineral products, which the Indians, by reason of ignorance and poverty, are unable to develop. Thus much wealth is lost to the world and no benefit of any kind derived by anyone.

On most of the Indian reservations sufficient water could be developed, at a comparatively small cost, to irrigate more than enough land to supply the material wants of the Indian population. On the Apache Reservation, in particular, there are many fine streams of water that flow perennially and in such quantities as would make every individual Apache wealthy if properly applied to the land.

I desire to call your attention particularly to the great injury done to the Pimas by reason of the white man's preemption of all the water running in the Salt River above their reservation. The Pima tribe, as you well know, have ever been tolerant of the white man's aggressions. Years ago, when the Indians were numerous and the white men very few, pale faces could always find a friendly harbor among the Pimas. These Indians protected the whites against the murderous assaults of the more turbulent and vicious Apaches, and in many ways showed fine traits of character. As the white population grew it became more aggressive and greedy, until now they have absorbed all the water above the Indian reservation, leaving the Indians destitute and causing much poverty and distress.

It seems to me that it would be wise if you would call the attention of the Department to the present state of affairs in a special communication. It is not my desire, in any sense of the word, to work a hardship against the white settlers, although they are in the wrong in this matter. But I do think and believe it to be the duty of the United States Government to build a reservoir for the conservation of the flood waters, which waters can be carried to the Pima Reservation for its use.

This would be a matter of great economy to the Government, for the reason that with sufficient water, 40 acres is as much land as any family, white or red, can well cultivate, and enough to make more than a good living. By allotting land in 40-acre tracts to the Pima Indians, there would be good land enough left for allotments to the Papago Indians also, and still leave many acres which could be sold, the proceeds of which sale could go toward reimbursing the Government for its outlay in building the reservoir.

Another phase of this question is more vital and immediate. If water is not provided for these Indians soon, they will become paupers which the Government must feed and care for in every way in order to prevent them from swarming over the country and developing into vagabonds and criminals.

All other Indians in the Territory through the past year have been peaceful, and there is no news of any importance to report.

EDUCATION OF THE INDIANS.

The Indian Office during the past fiscal year has been generous in its appropriations for the education of the Indian youth. Some new schools have been established, and many or most of the old ones repaired or improved. Of the new schools the most important are those at Rice Station, on the San Carlos Reservation, and at Truxton Canyon, in Mohave County, established for the benefit of the Hualapai tribe of Indians. Several excellent day schools have been established on the Navajo Reservation and on the Pima Reservation. There are now about 2,340 Indian children attending school in the Territory. This is a most excellent showing, and gives weight to our belief that in a generation the great majority of our Indian population will be assimilated into American ways and civilization.

THE PHOENIX INDIAN SCHOOL.

This school is ten years old and held its first commencement in April. Four pupils graduated from the regular school course, and 11 from the domestic science class of the industrial department. Of the 4, 1 was a Pueblo from New Mexico, 1 an Apache from Arizona, and 2 Mission Indians from southern California. One, at least, of the 4 has ability above the average and ambition enough to become more than an ordinary breadwinner. Two of the other 3 are young people of ordinary ability and should always be decent, honest, and industrious citizens. The fourth has a bright brain, is keen of perception, amiable, and likeable, but possesses a too generous heritage of the indolence peculiar to his tribe to quicken into a very potent factor in civilized life. He is of the kind who must always be bolstered and must always earn his living among whites or he will become a degenerate, blanket Indian. He has had extraordinary advantages, too, in the way of contact with civilization and civilized environment.

The class graduating from the domestic science department was an attractive and charming one in every particular. They were all girls from 16 to 18 years of age, bright, capable, and enthusiastic. The best part of all is found in the deep interest shown by them in their work and their genuine liking for cooking and

humble household work. A little more of literary training, constant practice in domestic science for a time, and much earnest endeavor on the part of those white people with whom these girls are thrown in contact in order to develop the moral faculties, and everyone of these girls should become splendid factors in domestic life. These girls are now fairly started on the highway that leads to the best civilized life. They can reach its pleasant retreats by their own efforts, aided by others, and there can be no excuse for failure.

The health of the school during the year has been excellent. While all around us have raged sieges of most of youths' epidemics, including that dread disease, smallpox, our school has escaped their dread visitation. This statement is rather remarkable in a school of over 700 pupils. This pleasant and comfortable state of affairs is due to the perfect climatic conditions of the Salt River Valley, and to the school's excellent sanitary condition.

The literary work of the school has been kept up to its past high standard. The corp of teachers has been a very good and satisfactory one, and the management has been all that could be desired. Pupils passing through the literary classes of the school, under its present efficient management, aided by the present corps of assistants, can not fail to evolve ideas of progress and nobility; can not fail to have planted in their souls seeds of true manhood and true womanhood and the desire and ambition to succeed.

The industrial work of the school has been conducted in a more satisfactory manner than ever before, but, owing to various causes, has not yet reached the highest standard. Some of the branches in their department have developed most excellent work. Especially is this true in the branch of domestic science, household work, and designing and manufacturing of garments. The sloyd, ordinary and mechanical drawing, modeling, painting, etc., have been excellent. The highest state of efficiency in any branch of the industrial work has been attained in the sewing department. There are many of our girls who are excellently proficient in cutting and making garments of all kinds for both sexes. A few are extremely skillful in fine needlework. As an example of this proficiency, we cite the fact that Mrs. Phoebe A. Hearst, when shown the fancywork made in our sewing department for exhibition at the Buffalo Exposition, was so delighted that she took the entire consignment, paying for one piece alone $100.

The school paper, The Native American, has been conducted in a highly satisfactory manner, as has been evidenced by the many letters received from all over the country, commending us on its make-up in a literary and typographical sense.

The school has not been enlarged by the addition of new buildings during the year, nor has it been desirable to increase the present capacity. The school has grown so rapidly in the last four years that a pause was needed in order to permit of putting things in order. While the normal capacity of the school is but 600, more than 700 have been enrolled during the year. We were enabled to carry this large overdraft owing to the great demand for pupil labor. At the present writing nearly 300 pupils are enjoying outing privileges, receiving as compensation from $8 to $30 per month. That our pupils give general satisfaction is evidenced by the ever-increasing demand—a demand that it has been impossible to supply.

The important event of the year was the visit of the President and his party to the school on the forenoon of May 7. This visit was an event long to be remembered and earnestly discussed by the student body.

THE ARIZONA INDIANS IN AGRICULTURE.

The Indians of Arizona were among the earliest agriculturists on American soil. With the exception of the Apaches, they are all either agricultural or pastoral. The Pima, Maricopa, and Moqui Indians, when first visited, were plowing, sowing, and irrigating the arid yet fertile soil of their settlements. Hundreds of acres of desert land have been converted into fruitful fields of waving grain by means of their crude irrigation systems. Their greatest need to-day is the systematic and scientific development of whatever water their reservations afford, and its just and equal distribution.

Until within the last few years, when the rainfall has been considerably below the average, the Indians, with the exception of the Apaches, have been practically self-supporting. The principal crops raised are corn, wheat, barley, beans, melons, pumpkins, and onions. Barley is often cut green for hay and sold to the white cattle owners to be succeeded by corn or vegetables as a second crop.

During the last ten years there has been much suffering by reason of the scarcity of water for irrigation purposes. The white settlers have in many places constructed reservoirs and ditches in such a way as to lessen the water at the disposal of the red men. As a result, the acreage and yield of the various cereals is materially less in 1899 than in 1889, as may be seen from table 1. The figures for 1889 are taken from the report of the Commissioner of Indian Affairs.

TABLE 1.—*Production of grains and hay by the Indians in 1899 and 1889.*

Crop.	1899.	1889.	Increase.
	Bushels.	*Bushels.*	*Per cent.*
Corn	70,836	15,388	360.33
Wheat	66,320	102,784	[1]35.76
Barley and oats	20,630	37,140	44.45
Hay	1,037	1,030	.68

[1] Decrease.

The dairy products are comparatively insignificant. Of the 62 milch cows on the reservations, 21 are owned by white men. The Indians milk their cows intermittently and, with the exception of the Fort Apache Reservation, report no sale of milk, butter, or cheese. The Apache produced 658 pounds of butter in 1899 and sold 366 pounds.

Three other reservations (Gila River and Salt River, Colorado River, and Moqui) report milk produced, but no sales.

PIMA AND MARICOPA.

The Pima and Maricopa tribes, practically inseparable, are located on the Gila Bend and Gila River and Salt River reservations. Nearly the entire population is dependent upon the resources of the Gila River Reservation for support, the others being small in area. The Pima have been an agricultural people from time immemorial, and are notably peaceable, industrious, and independent. During the last ten years they have suffered greatly from scarcity of water. As a result, they have gradually fallen from a condition of independence and prosperity until they are practically on the verge of starvation, and are largely dependent upon Government rations for support.

The Gila River Reservation contains about 357,120 acres, of which it is estimated one-half would be cultivable if it had a sufficient water supply. The soil is very fertile, but without irrigation is practically a desert. The Gila River has always been the source of water supply, and approximately 7,000 Indians are dependent upon it for their support. Before the construction of the Florence dam, a short distance above the reservation, the river furnished an abundant supply; since the diverting of the water destitution has come to the Pima. The water taken from the river by this canal is never returned to it, so that during certain seasons of the year the bed is almost dry.

The principal crop is wheat, but corn and barley are raised. The Gila River and Salt River reservations, in size only a fractional part of a county, report an acreage sowed to wheat during the census year second only to Apache County; but the crop was much lighter than that of some counties having a more reliable water supply. The Pima are the only Indians to report the raising of alfalfa to any extent. The Gila River Reservation excels in the amount of acreage devoted to vegetables, and also in the production of poultry.

NAVAHO.

The Navaho Indians are a pastoral people, having tended flocks and herds from earliest times. Their reservation contains about 12,029 square miles, the greatest part of which is valueless. The land is adapted to raising sheep and goats, and some of the wool is used by the Indians to make the famous Navaho blankets. Cultivation of the soil can be carried on only in the mountain valleys and along some of the streams.

The flocks of the Navaho have suffered greatly during the last ten years on account of the steadily decreasing rainfall, and the resulting scarcity of water and vegetation. The number of sheep and goats, estimated as nearly 1,000,000 in 1890, has been constantly decreasing until now the number scarcely exceeds 500,000. Another contributing factor is the drought that has caused an almost total failure of crops; in consequence, the Indians are forced to slaughter their flocks to keep from starvation. In addition to sheep and goats, the Navaho raise large herds of Indian ponies. These ponies tramp out the grass to a greater extent than either sheep or goats and are practically worthless except as food, for which they are utilized, the Indians seeming to relish horseflesh as much as mutton.

The only crop reported is corn. Squashes, melons, pumpkins, and vegetables were planted, but did not mature on account of the dry season. The crops raised

in recent years have not been sufficient to support over one-fourth of the population. The Navaho own nearly one-half of all the goats in Arizona. The number of fleeces reported by them is exceeded only by Apache County, but the product is much lighter and of poorer quality.

The report for this reservation includes only about one-half of the Navaho tribe, relating only to the Indians on the reservation. The scarcity of vegetation has forced about one-half of the tribe to wander over parts of New Mexico, Colorado, and Utah, in order to maintain their flocks and herds.

MOQUI.

The Moqui, or Hopi,[1] Indians are not reservation Indians. They live in pueblos similar to those of the Pueblo Indians of New Mexico. Their reservation embraces an area about 55 miles east and west and 65 miles north and south. The water supply is very limited, and irrigation is carried on in the primitive Indian method. The Moqui are provident and self-supporting. They have been known to have a supply of corn and dried peaches on hand from two to four years. The principal crop is corn, of which they raise nearly as much as the other tribes of the Territory combined. Other products are sweet corn, squashes, beans, and melons. The majority of farms are patches of from 3 to 20 acres, a few having as high as 30 acres under cultivation. They also possess large flocks of sheep and goats.

The Moqui are the only Indians reporting orchard products to any extent. Peach trees to the number of 15,541 are reported as owned by them, but the 130 bushels of fruit given as the total crop is undoubtedly too small. Most of the peaches are dried and stored away and perchance were not reported.

APACHE.

The Apache are located on the Fort Apache and San Carlos reservations. By nature they are wild, nomadic, and warlike, and only within recent years have they adopted peaceful pursuits. They are now making a steady advance, especially in agriculture.

The principal products are corn and barley, their corn crop having been surpassed only by that of the Moqui. The San Carlos Apache raise a large amount of wheat, while this crop on the Fort Apache Reservation is still an experiment. The Apache own a considerable number of cattle, but as they use them for food their herds do not increase very rapidly.

The Fort Apache country is well adapted to grazing, and when a water supply sufficient to mature crops is furnished the Indians will become self-supporting and prosperous. At present 20 per cent of the Fort Apache Indians and 33 per cent of those on the San Carlos Reservation require Government rations, while continued drought, with poor irrigation facilities, is increasing the percentage.

COLORADO RIVER RESERVATION.

The Colorado River Reservation, the home of 650 Mohave,[2] extends for 60 miles along the Colorado River, and contains about 240,000 acres. A portion is subject to the annual overflow of the Colorado River, but the larger part requires irrigation to raise any crop. It is estimated that nearly the entire valley could be irrigated with an inexhaustible supply of water at a nominal expense. The land thus irrigated could support nearly all the Indians of Arizona.

The resources of the reservation are very great. The soil is as fertile as any in Arizona, and crops will grow the year around. All fruit trees indigenous to southern California thrive here.

Wheat is the most successful crop of the Mohave, but barley and corn do well. The vegetables usually grown are beans, melons, and pumpkins. A centrifugal pump recently installed irrigates about 500 acres.

PAPAGO.

The Papago, or San Xavier Reservation, embraces an area of 105 square miles. The chief occupation of the Indians is agriculture, in which they are making steady progress, although they have experienced many drawbacks. They are industrious and economical, spending the money received from their crops on improved machinery and in building new homes.

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[1] The proper tribal name, according to the Bureau of American Ethnology and the Indian Bureau.

[2] Report of Commissioner of Indian Affairs, 1900.

CAPITOL GROUNDS.

The main products are corn, wheat, and barley. On account of a disastrous frost, very little grain was harvested in the census year, the crops having been cut green for hay.

WALAPAI AND HAVASUPAI.

The Walapai Reservation contains 730,880 acres, very little of which is suitable for agriculture. Water is scarce and can be found in few places. The Walapai engage in agriculture on a small scale, about 100 acres comprising their total area in crops. Corn, beans, melons, and pumpkins are cultivated. Stock raising is their principal pursuit, the majority of them herding for white men near the reservation, instead of raising their own animals.

The Supai (or Havasupai) are in a more prosperous condition than their cousins, the Walapai. Located as they are at the bottom of a canyon, shut in from the outside world, with plenty of water for irrigation and good soil, they have every inducement to become good farmers. They have about 350 acres in corn, beans, pumpkins, and melons. Orchards of peach trees are also found.

PUBLIC BUILDINGS.

The public buildings of the Territory comprise the capitol, situated at Phoenix; the Territorial University, at Tucson; the Territorial Prison, at Yuma; the Asylum for the Insane, at Phoenix, and the normal school buildings at Tempe and at Flagstaff. A reform school for youthful offenders was provided for by the twenty-first legislative assembly. The institution will be at Benson, in Cochise County, and the construction will begin early next year.

The Territorial capitol is generally conceded to be one of the handsomest buildings of the kind in the country. The people of the Territory are justly proud of it, and are proud of the fact that for a moderate cost—approximately $130,000—they have a building which in some other communities might have represented an expenditure very much larger. Not a dollar was wasted in construction.

The building is 184 by 84 feet in size, and four stories high. The first story is of granite and the superstructure of tufa stone—all Arizona products.

The rotunda is 44 feet in diameter, and extends from the ground floor through all the stories of the building to a height of 78 feet, being surmounted by a dome which is crowned by a statute of Liberty 16 feet in height.

The dimensions of the halls provided for the legislative bodies are 38 by 36 feet, and special attention has been given to the acoustic properties of these halls and to their ventilation. The gallery space in each hall has a seating capacity of between 200 and 300, and in the surrounding halls are the committee and other rooms required for the accommodation of the assembly.

Spacious offices are also provided for the governor and other Territorial officers.

The capitol grounds comprise 10 acres lying 1 mile west of the business section of Phoenix. The design on the east side of the grounds is geometrical in style, and very attractive. The lawns of the west half of the grounds have not been completed.

The principal deciduous trees with which the grounds are ornamented are the Arizona ash, the Russian mulberry, the umbrella tree, the Mexican chino, the eucalyptus, and a few elms. Among the palms are the California fan and date palms, the blue Japanese fans, and a large variety of yuccas. The shrubs comprise specimens of Australian, Chinese, Japanese, European, and native varieties, and there is a fine collection of cacti and a fair one of roses.

When the work in contemplation has been carried out, the capitol grounds will form an admirable setting for the new building.

The Territorial Prison buildings are inclosed with a wall, the front and rear lengths of which are 290 feet, the sides being 321 feet long. This does not include the woman's department at the southwest corner, which is about 30 by 30 feet. The walls are 20 feet high, 8 feet thick at the bottom and 5 feet at the top, which is surmounted by a cement cap and coping. A guardhouse of frame construction and shingle roof is situated on each corner of the walls, two of the houses being two stories high.

Inside of the walls is the cell house, 134 feet long by 65 feet, built of rock and iron; a building of adobe, 167 feet long by 34 feet in width, comprising the engine room, boiler room, tailor and shoe shops, laundry, bath house, and library, and the kitchen and dining-room building is also of adobe, 110 by 21 feet. The dining room is 75 feet long and 18 feet wide inside. A covered corridor connects this building with the east end of the cell house and with the office of the assistant superintendent.

Outside the walls are the office of the superintendent, the same building, one story in height and 38 by 38 feet in size, being also used for a storehouse, and a two-story building for the sleeping accommodation of the guards.

The insane asylum consists of a main central building of brick, two wings of two stories, and basements. The main building is 100 feet long and 50 feet wide. A hall of 12 feet in width runs the entire length of the building. On each side of the central structure there is a wing 100 feet long and 40 feet in width, separated from the main building by a vestibule 16 feet wide. The outbuildings consist of a general dining room 100 feet by 40 feet, with two wings each 16 by 20 feet. A building containing the engines, boilers, dynamos, and pumping plant, and the stables, carpenter shop, blacksmith, and paint shops comprise the other buildings of importance. The ornamental grounds in front of the asylum contain 4 acres tastefully stocked with trees, semitropical flowers, plants, and palms. The asylum is situated 2 miles east of the business section of Phoenix.

The normal school building at Tempe is a commodious structure 136 feet long, 80 feet wide, and three stories high. The lower story is of brown sandstone, and the other two of pressed brick with sandstone trimmings. This edifice is beautiful in architectural design, convenient in arrangement, and substantial in construction. Its appointments embrace all the modern school conveniences, such as cloakrooms, closets, recitation rooms, study hall, assembly hall, laboratories, etc. Its fixtures comprise a complete outfit of tables and cases sufficient to accommodate 36 students working at the same time, tablet-arm chairs to seat 160 students, recitation seats for 100 students, tables, chairs to accommodate 40 students in drawing at the same time, besides desks and sittings in the normal department proper. In addition to this, the school of practice is furnished with adjustable seats and desks and other modern appliances to accommodate pupils of the several grades to the number of 70. The assembly hall is seated with 400 tablet-arm opera chairs, and will accommodate 500 persons when seated to its full capacity. All things considered the building is excellently equipped for the purposes of normal school work.

A second normal school is located at Flagstaff, in Coconino County, and is an important addition to the educational system of the Territory. It is located on a tract of 130 acres of land previously acquired by the Territory. The building is of stone, commodious and convenient in its appointments. It is the finest public building in Arizona so far constructed, except the capital.

A description of the university will be found under the head of Education.

THE TERRITORIAL PRISON.

It is shown in a brief description, under the title of public buildings, that the Territorial prison is not modern in material and construction. It is not adapted to economical management. Under proper conditions it should be self-supporting, or nearly so; but instead of that it is maintained at a large expense.

At an early date it will be necessary to replace it with an institution properly constructed and equipped to meet existing needs.

In his annual report for the fiscal year ended June 30, 1901, the superintendent shows that the total net cost of maintenance of the prison for the year was $38,072.89. The net cost for each prisoner for the year was $150.48. The net cost per day for each prisoner was 41 cents—the lowest net cost for the year that the prison ever had.

At the close of the year the number of prisoners was 265. The average number in confinement during the year was 253. The number received was 135; the number discharged, 126. Of these, 73 were by expiration of sentence, 20 by order of United States court commissioner, 13 by pardon, 11 by parole, 4 by escape, 3 by death, and 2 by commutation of sentence.

On June 30 there were 124 white prisoners, 113 Mexicans, 19 Indians, 6 negroes, and 3 Chinamen. But 2 of the total number were women. The number of prisoners accredited to the Territory was 224; to the United States, 21.

Of those received during the year, there were 56 whites, 55 Mexicans, 3 negroes, 7 Indians, and 5 Chinamen.

The superintendent reports that throughout the year the health of the prisoners was good. This in a large measure was due to the sanitary conditions of the institution and enforced cleanliness of the convicts. Of the 3 who died, 2 were in impaired health when they entered the prison.

NEW LEGISLATION.

In compliance with the provisions of an act passed by the twentieth legislative assembly, the executive appointed a commission known as the Code Commission, consisting of three members of the Territorial bar, to revise the statutes of the Territory, including the penal code. The report of this commission was submitted to the twenty-first assembly in January last, and its consideration and adoption constituted the most important work of the session. The revised laws have just been printed, in one volume. On account of the great amount of work involved in the consideration of the revision, the limited time in which the executive was required to pass upon it before the close of the session, and particularly because it was impossible to disapprove of many objectionable features without subjecting entire chapters to a veto, it was inevitable that errors would be included in the revised statutes as finally printed. It is hoped that such as there are will prove to be unimportant, but undoubtedly the next legislature will find occasion to review and correct mistakes in a number of instances.

Aside from the revision of the statutes, the most important acts of the twenty-first legislative assembly comprised:

An act authorizing an issue of Territorial bonds in the sum of

$30,000, to cover the expenses of a proper representation of Arizona at the International Exposition at St. Louis in 1903.

An act exempting from taxation for ten years all railroads the construction of which should begin within one year.

An act authorizing the Roosevelt Rough Riders' Association to place a tablet in the rotunda of the Territorial capitol in honor of the troopers of the First Volunteer Cavalry who fell in the Spanish war (the preceding legislature had made appropriation for a suitable case in which to preserve the regimental flag of the Rough Riders, the same was placed in the office of the governor, and the flag is one of the principal attractions for visitors to the capitol).

The repeal of an act of the twentieth legislature which required the payment of a poll tax before registration for voting.

An act authorizing the appointment of "water-storage commissioners" in certain counties.

An act providing for the construction of a reform school for vicious youth.

An act authorizing the governor to organize a company of Rangers consisting of a captain, a sergeant, and 12 privates, for the pursuit and arrest of criminals in the mountain fastnesses and frontier regions of the Territory.

An act making a tax levy for repair of the Territorial prison at Yuma (passed over the veto of the governor).

An act authorizing certain counties to appoint immigration commissioners.

An act providing for the dedication of the capitol building.

An act making appropriations for the maintenance of the Territorial government for the biennial period ending with the fiscal year 1903.

THE NATIONAL GUARD.

I am pleased to report that the twenty-first legislature retrieved in part the injury done the National Guard of Arizona two years before by passing a new military code, which had been prepared with great care by the adjutant-general, assisted by officers of the guard.

This code provides for ten companies, to be organized as infantry or cavalry, as the commander-in-chief shall deem most expedient, a regimental band, and a hospital corps, and signal corps each of ten enlisted men.

The minimum strength of each company is placed at 30 officers and men, and the band is not to exceed 33 men.

Each company organized under this act is to receive the sum of $30 per month from the Territory.

The adjutant-general is paid the sum of $300 per annum for his services.

Of the ten companies authorized by this act eight are in existence and another is about to be organized. The hospital and signal corps are also organized, but for want of funds the band, which receives no money from the Territory, has not been reorganized since its disbandment in 1899.

The military code also provides that "the military organization of the University of Arizona, of the Territorial Normal School, and of such other educational institutions within the Territory of Arizona as may be supported by National or Territorial funds, are hereby made a part of the National Guard of the Territory."

The governing board of such institution has the full power to pre-

scribe uniform and regulations, and a member of the faculty shall be commandant of cadets, and shall be so commissioned by the governor with the rank of captain or of major, as the school has one or more companies of cadets. The military drill and instruction shall conform as closely as practicable to the regulations and customs of the National Guard of Arizona.

The Territory furnishes the cadet companies with ammunition for target practice, sees to its expenditure and under proper regulations awards decorations for proficiency, and annually inspects the company as in the National Guard proper; but furnishes no equipment, nor is any money allowance made them as companies of the guard. They are not liable to be called into active service except that their services may be volunteered, in which case they shall be on the same footing as other organizations in like service.

There is under the provisions of this act two companies of cadets at the University of Arizona at Tucson, and one company at the Territorial Normal School at Tempe.

The military code provides that the National Guard of Arizona, when on duty, shall wear the uniform of and shall be equipped, drilled, and disciplined in the same manner as the Army of the United States. The undress uniform, however, is all that has been furnished them, and for service and utility it is all that can be desired. It is hoped that all the troops of the guard may soon be furnished with the khaki uniforms, as the semitropical nature of our summer climate makes the blue uniform rather too warm for comfort. Under orders, officers, except those of the general staff, are limited to the undress uniform, except on social occasions.

The National Guard of Arizona has adopted the Army of the United States as its standard in military matters, and though embarrassed by inadequate appropriations, inefficient equipments, and unsuitable armories, yet there is evidenced everywhere by manifest proficiency that there is a determined purpose on the part of the organizations to reach a superior degree of excellence.

STATEHOOD.

Never before were the people of the Territory so generally and earnestly aroused on the question of statehood. For more than ten years there has been a unanimity of sentiment on the subject, and during each Congress the effort to obtain recognition of our rights has been renewed.

The fifteenth legislature authorized a constitutional convention, which was held and at which there was a full attendance of delegates. A constitution was framed and later was adopted at a popular election. The proceedings cost the Territory some $30,000. Bills for the admission of Arizona passed the House of Representatives in the Fifty-second and Fifty-third Congresses and were favorably reported to the Senate; and both the Senate and House of Representatives of the Fifty-fourth Congress reported admission bills favorably. The press and the people have persisted in presenting reasons for admission, and thus the agitation has gone on with that perseverance and faith in ultimate success which marks the citizens of Arizona as peculiarly American.

It is recognized that the prospects for success are better now, and it is felt that the earnest work of years should tell. It is evident that the people of the East have learned more about the Territory during

the past two years than in all our previous history, and that they have become sufficiently informed concerning our citizenship, resources, and capabilities to assent to our entrance into the Union. It is contended that if at any time there were reasons of partisanship or expediency for our exclusion, those reasons no longer exist. And always it has been urged very properly that under no circumstances should partisan considerations prevent justice, and it is not believed that broad-minded statesmen will permit them longer to have weight. Our people consider that they are justified in demanding admission on every ground of right.

The showing as to population, civilization, wealth, education, Americanism, and resources, developed and undeveloped, constitute an argument which is unanswerable.

It should be understood that the yoke of Territorial vassalage does not lie heaviest in the matter of the form of government, although complete self-government is a right so dearly prized that it alone would furnish abundant cause for the request for statehood. The disadvantages of a Territorial form of government touch the material interests of our people. Arizona offers a profitable field for the investment of capital in a multiplicity of enterprises. Our developed mines have made the Territory famous the world over. Our undeveloped mines which await capital can not be computed. The opportunities for great profit and the creation of vast wealth through the construction of storage reservoirs for irrigation are many. New railroads which would develop more extensive mining districts are needed. In attractive openings for capital Arizona is rich beyond measure. But it is realized that to enlist the cooperation of the financial world on a large scale we need statehood first of all. For some reason capital is more or less suspicious of Territories. So far as this Territory is concerned that suspicion is altogether groundless, but it is not easy to convince the investing public that there is no basis for lack of complete confidence in our stability, financial integrity, and firm enforcement of the law. To overcome prevalent misapprehensions and place Arizona in its true light before the world is the ambition of our people.

I predict that within five years after the Territory is admitted into the Union there will be created within the borders of the new State more wealth than all that is now assessed, and that the population will be quadrupled.

In short, there is every reason for granting statehood to Arizona, and not one for denying us the freedom to which we are justly entitled.

RECOMMENDATIONS FOR CONGRESSIONAL LEGISLATION AND ACTION OF THE DEPARTMENT OF THE INTERIOR.

1. That Arizona be admitted as a State.
2. That all the public lands within the Territory be ceded to the Territory or State.
3. That until the lands are ceded authority be granted to the Territory to lease the grazing lands.
4. That all the lands within the Territory be surveyed.
5. That a Government assay office and branch mint be established in Arizona.
6. That an appropriation be had for artesian-water exploration within the Territory, and that such exploration be ordered.
7. That the Government proceed with the construction of the proposed reservoir dam near San Carlos on the Gila River.

8. That a commission be appointed for ethnological and archaeological research in the Territory, and that a suitable appropriation be made by Congress therefor.

Respectfully submitted.

N. O. MURPHY, *Governor.*

Hon. E. A. HITCHCOCK,
Secretary of the Interior.

APPENDIX.

ROSTER OF TERRITORIAL OFFICIALS.

EXECUTIVE DEPARTMENT.

Governor (appointed by the President), Nathan O. Murphy, Phoenix; private secretary to the governor, and Spanish interpreter and translator, Sims Ely, Phoenix; secretary of the Territory (apppointed by the President), Isaac T. Stoddard, Phoenix; assistant secretary of the Territory (appointed by the governor), William English, Phoenix; Territorial treasurer, Thomas W. Pemberton, Phoenix; Territorial auditor and bank comptroller, George W. Vickers, Phoenix; attorney-general, Charles F. Ainsworth, Phoenix; superintendent of public instruction, R. L. Long, Phoenix; adjutant-general, H. F. Robinson, Phoenix; board of control, Governor N. O. Murphy, chairman; George W. Vickers, auditor; Ephraim J. Bennitt, citizen member.

JUDICIARY DEPARTMENT.

Supreme Court (appointed by the President), Webster Street, chief justice, Phoenix; George R. Davis, associate justice, Tucson; Fletcher M. Doan, associate justice, Florence; Richard E. Sloan, associate justice, Prescott.

District court, first judicial district (comprising counties of Pima, Cochise, and Santa Cruz): Judge, George R. Davis; clerks, Clinton D. Hoover for Pima county, Tucson; A. H. Emanuel for Cochise County, Tombstone; Samuel F. Noon for Santa Cruz County, Nogales. Court commissioners, William H. Culver, Tucson; Frank J. Duffy, Nogales; A. H. Emanuel, Tombstone.

District court, second judicial district (comprising counties of Pinal, Gila, and Graham): Judge, Fletcher M. Doan; clerks, Daniel C. Stevens for Pinal County, Florence; Charles T. Martin for Gila County, Globe; Frank Dysart for Graham County, Solomonsville.

District court, third judicial district (comprising counties of Maricopa and Yuma): Judge, Webster Street; clerks, W. C. Foster for Maricopa County, Phoenix; W. H. Brimley for Yuma County, Yuma; court commissioners, C. W. Johnstone, Phoenix; W. H. Brimley, Yuma.

District court, fourth judicial district (comprising counties of Yavapai, Mohave, Coconino, Apache, and Navajo): Judge, Richard E. Sloan; clerks, J. W. Watts for Yavapai County, Prescott; L. O. Cowen for Mohave County, Kingman; C. M. Funston for Coconino County, Flagstaff; ——— for Navajo County, Holbrook; John T. Hogue for Apache County, St. Johns.

BOARD OF EQUALIZATION.

M. P. Freeman for the first judicial district, Tucson; Michael Ohl for the second judicial district, Bonita; George W. Vickers (as auditor) for the third judicial district, Phoenix; R. N. Fredericks for the fourth judicial district, Prescott; clerk, Harvey J. Lee, Phoenix.

OFFICERS OF TERRITORIAL SCHOOL SYSTEM.

Territorial board of education: Governor N. O. Murphy; R. L. Long, superintendent of public instruction; Thomas W. Pemberton, Territorial treasurer; and the president of the university and the principals of the normal schools at Tempe and Flagstaff.

President Territorial university, H. Yale Adams (acting), Tucson.

Board of regents, Territorial university: William Herring, chancellor, Tucson; J. A. Zabriskie, Tucson; Herbert Tenney, Tucson; A. V. Grossetta, Tucson;

R. L. Long, superintendent of public instruction, Phoenix; the governor, ex officio.

Board of education of the Territorial normal school at Tempe: R. L. Long, superintendent of public instruction, Phoenix; S. M. McCowan, Phoenix; J. H. McClintock, Phoenix.

Board of education of the Territorial normal school at Flagstaff: R. L. Long, superintendent of public instruction, Phoenix; A. A. Dutton, Flagstaff; T. E. Pollock, Flagstaff.

TERRITORIAL PRISON.

Superintendent, Herbert Brown, Yuma; assistant superintendent, Ira P. Smith, Yuma; Secretary, H. S. Laughlin, Yuma.

TERRITORIAL INSANE ASYLUM.

Superintendent, Dr. W. H. Ward, Phoenix.

LIVE STOCK SANITARY COMMISSION.

Burt Dunlap, Tucson; Lucius P. Connor, Congress; Will H. Kay, Phoenix; Horace Harrison, secretary, Phoenix.

TERRITORIAL VETERINARIAN.

Dr. J. C. Norton, Phoenix.

FISH AND GAME COMMISSIONERS.

T. S. Bunch, Flagstaff; Eugene Allison, Jerome; W. L. Pinney, Phoenix.

UNITED STATES DISTRICT ATTORNEY.

R. E. Morrison, Prescott; assistant United States district attorney, Thomas D. Bennett, Phoenix.

UNITED STATES MARSHAL.

Myron H. McCord, Phoenix.

UNITED STATES INTERNAL-REVENUE COLLECTOR FOR ARIZONA AND NEW MEXICO.

A. L. Morrison, Santa Fe, N. Mex.; deputy for Arizona, S. M. Cullom.

UNITED STATES COLLECTOR OF CUSTOMS.

Frank L. Doan, Nogales.

UNITED STATES LAND OFFICE, PRESCOTT.

Register, F. A. Tritle, jr., Prescott; receiver, J. C. Martin, Prescott.

UNITED STATES LAND OFFICE, TUCSON.

Register, M. W. Moore, Tucson; receiver, John H. Bauman, Tucson.

UNITED STATES SURVEYOR-GENERAL.

Hugh H. Price, Tucson.

DELEGATE IN CONGRESS.

Marcus A. Smith, Tucson.

BOARD OF REGISTRATION IN DENTISTRY.

A. A. Doherty, Nogales; L. C. Gonazales, Prescott; H. J. Jessup, Phoenix; John A. Lentz, Phoenix; George W. Cool, Safford.

TERRITORIAL BOARD OF MEDICAL EXAMINERS.

Dr. C. W. Woods, Jerome; Dr. William Lawrence Woodruff, Phoenix; Dr. J. S. Barrett, Prescott; Dr. Ancil Martin, Phoenix; Dr. William Duffield, Phoenix.

BOARD OF TRUSTEES, TERRITORIAL REFORM SCHOOL.

C. F. Schumaker, Tucson; H. Buehman, Tucson; H. Gerwien, Benson.

CAPTAIN ARIZONA RANGERS.

Burton Mossman, Bisbee.

COMMISSIONERS TO REPRESENT ARIZONA AT THE LOUISIANA PURCHASE EXPOSITION, ST. LOUIS, MO., 1903.

T. E. Dalton, Phoenix; William H. Barnes, Tucson; Charles E. Taylor, Globe; W. C. Bashford, Prescott.

ROSTER OF COUNTY OFFICERS.

Apache County.—Supervisors, A. V. Gibbons, Benigno Lopez, and G. A. Conklin; sheriff, Leandro Ortega; district attorney, Alfred Ruiz; treasurer, T. C. Hill; recorder, Monico Garcia; assessor, Leandro Ortega; probate judge and county school superintendent, John T. Hogue; clerk of board of supervisors, Monico Garcia. County seat, St. Johns.

Coconino County.—Supervisors, J. C. Phelan, T. E. Pulliam, George Babbitt; sheriff, James A. Johnson; district attorney, J. E. Jones; treasurer, George Hoxworth; recorder, H. C. Hibben; assessor, J. B. Jones; probate judge and county school superintendent, N. G. Layton; clerk of board of supervisors, H. C. Hibben; surveyor, W. H. Power. County seat, Flagstaff.

Cochise County.—Supervisors, Thomas R. York, P. J. Delahanty, George B. Reay; sheriff, Adelbert V. Lewis; district attorney, Edward W. Land; treasurer, M. D. Scribner; recorder, Frank Hare; county school superintendent, E. A. Nichols; assessor, Walter T. Fife; probate judge, C. R. Bostwick; clerk of board of supervisors, James F. Duncan; surveyor, J. A. Rockfellow. County seat, Tombstone.

Gila County.—Supervisors, J. G. Oldfield, G. D. Barclay, M. J. Fuller; sheriff, J. H. Thompson; district attorney, George J. Stoneman; treasurer, A. H. Morehead; recorder, R. J. Williams; assessor, J. H. Thompson; probate judge and county school superintendent, P. C. Robertson; clerk of board of supervisors, R. J. Williams; surveyor, W. S. Sultan. County seat, Globe.

Graham County.—Supervisors, Henry Hill, Ira Harper, Wm. R. Waddill; sheriff, James Parks; district attorney, Lee N. Stratton; treasurer, George B. Gamble; recorder, Thomas Smith; probate judge and county school superintendent, Wm. A. Moody; assessor, Phil. C. Merrill; clerk of board of supervisors, Thomas Smith; surveyor, John Nash. County seat, Solomonville.

Maricopa County.—Supervisors, T. C. Norris, A. Hunsaker, J. A. Marshall; sheriff, S. S. Stout; district attorney, Arthur J. Edwards; treasurer, J. Elliott Walker; recorder, B. Frank McFall; county school superintendent, T. A. Fulton; assessor, C. W. Barnett; probate judge, J. H. Langston; clerk of board of supervisors, Neri Osborn; surveyor, Geo. R. Sturdevant. County seat, Phoenix.

Mohave County.—Supervisors, M. Scanlar, W. A. Neal, J. H. Johnson; sheriff, Henry Lovin; district attorney, Hugh L. Dixon; treasurer, Thomas McNeely; assessor, Henry Lovin; probate judge and county school superintendent, J. A. Logan; clerk of board of supervisors, John P. Feeney. County seat, Kingman.

Navajo County.—Supervisors, L. E. Divelbess, John K. Woods, J. H. Willis; sheriff, Frank P. Secrist; district attorney, W. H. Burborge; treasurer, F. M. Zuck; recorder, A. F. McAllister; assessor, F. P. Secrist; probate judge and county school superintendent, B. F. Jackson; clerk of board of supervisors, A. F. McAllister. County seat, Holbrook.

Pima County.—Supervisors, N. W. Bernard, L. M. Jacobs, Andres Rebeil; sheriff, Frank E. Murphy; district attorney, William F. Cooper; treasurer, Harry A. Drachman; recorder, Charles A. Shibell; county superintendent, William Angus; assessor, John E. Bogan; probate judge, S. W. Purcell; clerk of board of supervisors, Charles O. Rouse; surveyor, Homer Santee. County seat, Tucson.

Pinal County.—Supervisors, J. G. Keating, Thomas N. Willis, J. F. Mayhew; sheriff, W. C. Truman; district attorney, J. E. O'Conner; treasurer, A. F. Barker; recorder, Thomas G. Peyton; assessor, F. A. Chamberlin; probate judge and county school superintendent, L. C. Herr; clerk of board of supervisors, A. T. Colton. County seat, Florence.

Santa Cruz County.—Supervisors, Robert Williams, Richard Farrell, Emerson Gee; sheriff, T. J. Turner; district attorney, Frank J. Duffy; treasurer, Geo. B.

Marsh; recorder, Maurice Breen; assessor, T. J. Turner; probate judge and county school superintendent, W. A. O'Conner; clerk of board of supervisors, Maurice Breen; surveyor, Charles E. Perkins. County seat, Nogales.

Yavapai County.—Supervisors, J. R. Beatson, G. H. Schurman, D. E. Dumas; sheriff, J. L. Munds; district attorney, Reese M. Ling; treasurer, J. P. Storm; recorder, P. J. Farley; county school superintendent, J. B. Jolly; assessor, Wallace Willard; probate judge, C. P. Hicks; clerk of board of supervisors, J. H. Robinson. County seat, Prescott.

Yuma County.—Supervisors, T. W. Underhill, C. V. Meeden, J. C. DeWitt; sheriff, Gus Livingston; district attorney, W. F. Timmons; treasurer, D. L. Devane; recorder, C. P. Cronin; assessor, Frank Avila; probate judge and county school superintendent, A. Frank; clerk of board of supervisors, C. P. Cronin; surveyor, W. E. Marvin. County seat, Yuma.

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